Job Burnout: It's Becoming an Epidemic in DP Centers

By Jeffry Beeler
CW West Coast Bureau

In corporate data centers throughout the U.S., untold thousands of programmers and other computing specialists are falling victim to a little-understood but potentially incapacitating "disease" whose existence has only recently been confirmed and whose treatment is still the subject of considerable debate.

The disease in question goes by nearly as many names as it has symptoms and variations. Some know it as "job stress," others as "vocational shock." Most simply refer to the condition as "job burnout."

The illness' symptoms are as varied as they are insidious. In its early stages, the contagion is usually characterized by a lingering malaise that saps its victims' energy, dampens their enthusiasm for work and produces other undesirable side effects ranging from tardiness to increased absenteeism. As the affliction progresses, its destructive effects often become increasingly acute and overt.

Many of its victims have been known to swipe their employers' supplies, deliberately damage hardware, sabotage programs — and in extreme cases, physically assault and injure their co-workers in seemingly unprovoked outbursts of pent-up rage.

But whatever its name, the ailment has already gained a foothold — in one form or another — in at least

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NEWSPAPER

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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DOD Changes Bell Bill Stance As AT&T Goes To the Table

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — "The most significant development of the last six months" in the AT&T antitrust case is contained in a letter Defense Secretary Caspar Weinberger sent to Rep. Peter Rodino (D-N.J.) last month.

So said a knowledgeable source last week shortly after the Justice Department announced it had reopened negotiations with AT&T aimed at settling the government's charges, filed seven years ago, that Bell has violated the Sherman Act. According to the source, the Weinberger letter to Rodino reflects one of three recent developments that make AT&T more vulnerable than it was a year ago, thus indicating that this time the negotiations will produce a settlement. Several previous attempts to settle the case have failed.

Weinberger's letter endorsed efforts to, as he put it, "enact telecommunications legislation in the 97th Congress . . . regardless of the status of the antitrust suit."

This position contrasts markedly with what Department of Defense (DOD) officials were saying a year ago.

Last March, in a letter to U.S. Attorney General William French Smith, Weinberger "argued very strongly" for dismissal of the suit, as the defense secretary later told the Senate Armed Services Committee. These views also were conveyed to a Cabinet-level task force, which in June

(Continued on Page 4)

Unreleased FAA Report Details Plan to Upgrade ATC Computers

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. — An unreleased Federal Aviation Administration (FAA) report now circulating here details a multibillion-dollar plan to replace aging air traffic control (ATC) computer equipment and further automate ATC over the next 20 years.

Scheduled to be formally released Jan. 27, FAA Chief J. Lynn Helms' plan was designed to promote air safety and fuel savings while eventually cutting technical personnel by about a third, according to *The Washington Post*, which examined a copy of the report.

The "National Airspace System Plan" directly addresses the long-voiced concerns of members of the decertified Professional Air Traffic Controllers Organization — now jobless after their Aug. 3 walkout [CW, Aug. 10] — who for years decried the antiquity of the IBM 360-based ATC radar computers.

Begun last January, the study centers on installing advanced, standardized equipment and taking many functions out of human hands, the *Post* reported. Although staffing at airport and en route centers would be cut significantly, advanced equipment would allow fewer people to control more aircraft with greater safety, according to the study.

The plan specifies for the first time the FAA's plan in dealing

(Continued on Page 6)

Wang Unveils 32-Bit Machine Rivaling 4321

By Tim Scannell
CW Staff

LOWELL, Mass. — Wang Laboratories, Inc. last week introduced an entry-level version of its 32-bit VS 100 superminicomputer that is said to have twice the performance of IBM's 4321 at 85% the cost.

At the same time, the firm announced that it has reduced by up to about 43% the price on its VS 100 memory, established a multiple-purchase discount policy for its 288M-byte fixed-head disk drives and brought out two new Input/Output Processors (IOP) for its VS series computers.

The entry-level version of the VS 100, the VS 90 — which is presently the firm's smallest 32-bit system — is architecturally identical to the VS

(Continued on Page 4)

System/38 or 4300? Hard Choice for Users

By Tom Henkel
CW Staff

Is getting in on the ground floor of a new era better than investing in proven technology?

Many IBM users face that question when deciding whether to buy a System/38 processor or to migrate to the more traditional 4300 processor line.

Despite a rocky start, the System/38 appears to be developing into one of IBM's showcase systems. International Data Corp. (IDC), a market research firm in Framingham, Mass., calls it "the most radical departure from prior architectures to come out of IBM in recent years." And Yankee Group analyst Gerard Hallaren maintains that the System/38 "has a lot of potential; it's up to IBM to exploit it."

Analysis

Some system users applaud its data base management capabilities and applications development package, while others note that performance was less than expected.

Since the System/38 is a relatively new processor, there is comparatively little software designed for it, and IBM has yet to show users a clear migration path. Its architecture suggests that the System/38 could be developed into a considerably larger system than the three models currently on the market, according to some industry observers.

The System/38 is not totally compatible with other IBM or IBM-compatible processors. Although IBM recently announced communications enhancements that allow it to act as a remote job entry subsystem to a 370-era host [CW, Nov. 2], it is not directly compatible with 370-based systems.

However, Hallaren noted that Series/1 processors can be connected

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COMPUTERWORLD
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DPers Top Help Wanted Lists Again in '81, But Demand Falls Short of Forecast: Survey

By Tim Scannell
CW Staff

PHILADELPHIA — For the fifth year in a row, data processing and computer specialists topped the help wanted lists as the most wanted employees by companies within the U.S. However, the demand for these workers is more than 6% smaller than was projected last year, according to a survey just released by Fox-Morris Personnel Consultants and its affiliate, National Personnel Consultants, Inc.

According to the nationwide survey of some 3,200 employers representing a cross-section of leading U.S. industries, the demand for DP specialists at every level — from applications programmers to corporate data base managers — will rise 19% above 1981 levels. Last year, the personnel consulting agency projected a 25.6% rise in DP employee needs over the previous year's levels.

As in past years, computer programmers will be the most sought-after employees, with demand projected to rise 20.9% above 1981's figures. However, this year's demand for programmers is down nearly 15% compared with the new hire needs projected by Fox-Morris in last year's survey.

Need has also apparently ebbed for systems analysts and data base managers. Fox-Morris projects a 20.3% increase in the hiring demand for systems analysts this year as opposed to the 24.1% demand forecast in last year's survey. And the projected employer need for data base managers has dropped nearly 5%, from 20.6% forecast for last year to 15.7% expected in 1982, the survey showed.

Although the depressed figures seem to signal a shrinking market for the DP professional, Sanford L. Fox, president of the firm that conducts the yearly survey, insists that the data processing job outlook is still bright.

"The economy is in more of a downturn than it was a year ago," Fox explained when contacted at the firm's headquarters here. "We are in kind of a semirecession where hiring has been deaccelerated in general."

However, "although the numbers in terms of new jobs and new installations will be a bit slower because of the economy, there is no question that DP people will be very high on everybody's shopping list."

Prime Targets

Management-level personnel, especially corporate DP directors and vice-presidents who are familiar with both mainframe and distributed processing, will also be prime employee targets in 1982, he added.

While demand for DP personnel has dropped from last year, salaries have taken the opposite course. Computer programmers, with two to five years' experience, can expect to make an average high of $28,800, or about $5,000 more than was projected for last year, according to the survey. Systems analysts, with the same amount of experience, will earn from $28,400 to $33,300, which is about 10% to 30% more than projected for 1981.

Finally, covering both spectrums of the field, the Fox-Morris survey noted that corporate DP directors can expect to average about $60,000 in 1982 — about 12% more than was projected for last year — while entry-level computer science graduates will begin their careers at a little more than $21,000.

The employment projections and salary statistics contained in the survey may not necessarily reflect a true overall picture of the DP market since the firms taking part in the study are clients of Fox-Morris.

Besides its annual employment survey, Fox-Morris also conducts a mid-year survey to keep up with fast and frequent changes on the employment scene.

Performance Evaluation Groups Offered Dial-Up 'Bulletin Board'

WASHINGTON, D.C. — The National Bureau of Standards (NBS) is offering a free Computerized Bulletin Board System (CBBS) for computer performance evaluation users groups.

The system was designed to help groups involved in processor evaluation to exchange information.

To use the system, a user must have a terminal and a modem. To log on, the user dials (301) 948-5717. The system is menu driven and no preestablished accounts are necessary, according to NBS.

The system, based on a Z80 processor, is experimental and continued availability will depend on its use, NBS said.

Further information is available from Ken Moore at the NBS Institute for Computer Sciences and Technology, Room A265, Washington, D.C. 20234.

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GIANTS

46 of America's 50 largest firms now use SyncSort.

(But Old No. 8 is still a holdout!)

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THE FORTUNE 50–1981

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	Westinghouse Electric
Standard Oil (Ind.)	R. J. Reynolds Industries
General Electric	Goodyear Tire & Rubber
Atlantic Richfield	Beatrice Foods
Shell Oil	Xerox
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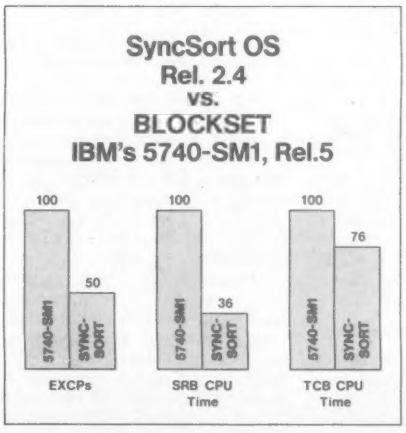

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Narcotics, Gaming Network Uncovered

DP Room Activity Probed in Raid on Prison

By Lois Paul
CW Staff

FRAMINGHAM, Mass. — A DP education program for inmates of the Massachusetts Correctional Institution (MCI) here apparently has been a little too successful. Acting on suspicions that inmates were using the prison computer system for a major narcotics network in metropolitan Boston as well as for gaming activities, more than 200 state and local police officers raided the coed facility last week.

A subsequent search of eight homes and vehicles of Boston-area residents believed connected to the drug network led to the arrest of five persons and the seizure by state troopers of 275 bags of a substance believed to be heroin, two weapons, almost $10,000 in cash and two automobiles.

Because Sterling Johnson, the special narcotics prosecutor for New York City , played a major role in the investigation, there have been rumors of ties between prison inmates and organized crime in New York. At a press conference held after the raid, Johnson declined to give details on his involvement but said, "Any narcotics crime that touches New York City, no matter where it is, I have jurisdiction."

'Operation Upper Crust'

The investigation and raid, dubbed "Operation Upper Crust," did not lead to the arraignment of any inmates by press time, nor were the results of the prison search available. However, Peter W. Agnes Jr., assistant district attorney for Middlesex County, indicated that the records of the DP inmate employment group, Con'puter Systems Programming have been seized.

The DP training program at several Massachusetts prisons began in 1967 with equipment donated by Honeywell, Inc. In 1973, the top programmers from MCI-Walpole and MCI-Norfolk were moved to MCI-Framingham, where Honeywell provided them with their own computer system. The inmates subsequently set up Con'puter Systems Programming, a service bureau business, which enables the prisoners to receive pay for their services [CW, Nov. 14, 1977].

"This inmate partnership has received national acclaim over the past five years as a model rehabilitation program," Agnes said. "Our investigation indicates that this group has perpetrated a colossal fraud on the Commonwealth of Massachusetts as a result of significant sums of money having been earned by the members of the partnership without the filing of legally required tax forms with the state Department of Revenue.

"It is also apparent that a number of inmates used the computer facilities of the partnership at MCI-Framingham as a cover to commit gaming violations and other crimes as well," Agnes continued.

Commissioner Michael Fair of the Massachusetts Department of Corrections reported that 34 male inmates were removed from the prison during the early morning raid. He would not confirm that their removal was connected with the raid, but did comment, "This will be the end of the coed facility at Framingham."

Task Force

Agnes is heading a four-person prosecution task force that expects to begin evaluating the results of the investigation and to make presentations to the Middlesex County Grand Jury immediately afterward. He indicated that the investigations most likely will lead to prosecution of inmates at the prison. Asked about the involvement of correction officials in the illegal activities, Agnes commented, "That is something the grand jury will have to decide."

Agnes said the investigations have been ongoing for several years and involve local and state law enforcement agencies in Massachusetts, New Hampshire, Maine, Rhode Island and New York. Additional investigations are still ongoing, in those states, he added.

Letter Shows New DOD Stance on Bell Bill

(Continued from Page 1)

recommended dismissing the antitrust suit.

It is believed that the DOD's position influenced the administration's chief telecommunications spokesman, Commerce Secretary Malcolm W. Baldrige, when he testified that same month in support of S. 898, the Senate's proposed rewrite of the Communications Act of 1934.

Baldrige made it clear that the White House preferred separation of Bell's vital parts along the lines of the Senate bill rather than divestiture, which the U.S. Justice Department has suggested in its suit against the phone company.

Recess Requested

Another result of this behind-the-scenes lobbying was a request by the Justice Department late last July for an 11-month recess of the trial. The request came from Assistant Attorney General William Baxter rather than from Gerald Connell, chief of the Justice Department's trial staff.

The request was based on an alleged need to let Congress pass a new communications act. Baxter argued that the legislators were unlikely to do this while the suit is under way. His statement echoed what the White House task force had said earlier after hearing from the DOD. Presiding Judge Harold Greene rejected Baxter's request.

According to the knowledgeable source, Weinberger's recently stated support for continuing the case while Congress tries to write a new communications act means that Bell's strongest advocate in the White House has now pulled back. As a result, he said, the administration "isn't likely to promote passage of S. 898 this year as strongly as it did last year."

Aside from this development, there have been at least two others that "seem likely to limit Bell's options," according to the source.

H.R. 5158, the Communications Act rewrite bill unveiled by Rep. Tim Wirth (D-Colo.) last month, is "much tougher" on AT&T than S. 898, he pointed out.

The bill is strongly supported by House Democrats, Bell's competitors and many of its major corporate customers. The latter two groups reportedly have put together $2 million to lobby for passage of H.R. 5158.

"The testimony and the documentary evidence adduced by the government demonstrate that the Bell system has violated the antitrust laws in a number of ways over a lengthy period of time," Greene said last Sept. 14 in the course of denying an AT&T motion to dismiss the suit. He added that on the three principal issues in the case — whether AT&T's interconnect policies have been anticompetitive, whether Bell has unfairly treated the specialized carriers and whether it has shut out indepenent terminal makers from selling to Bell operating companies — "the evidence sustains the government's basic contentions and the burden is on [AT&T] to refute the factual showings made in the government's case."

Whether AT&T's lawyers have been successful is unknown, of course, but just before the trial recessed for the December holidays, Greene sharply criticized AT&T for proposing to put unnecessary witnesses on the stand in January. He also rejected AT&T's objections to a request for documents made by the Justice Department during cross-examination of former AT&T legal officials.

Most indicative, probably, is Greene's recent statement that he believes AT&T, in responding to the competition that emerged after the Federal Communications Commission's Carterfone and MCI decisions, was "taking something away from a competitor that he would otherwise have" rather than guarding its own customer base against erosion.

Wang Brings Out 32-Bit Rival for the 4321

(Continued from Page 1)

100 except that the low-end system has no high-speed cache memory. Like its high-end predecessor, the VS 90 is most suited for distributed processing applications, but can be used singly for standard data and word processing, applications programming and remote communications, Wang said.

As on the larger machine, the VS 90's Central Processor (CP) supports binary, packed-decimal and floating-point arithmetic and includes 16 32-bit general-purpose registers.

Also like the VS 100, the VS 90's processor does not communicate directly with main memory, as is the case with the firm's other VS 16-bit computers. Rather, the CP connects with a bus adapter that provides an interface between the 16-bit data path of the IOPs and the 64-bit data path of the computer's system bus.

Unlike the VS 100, the newest VS machine has only a single bus adapter and can support a maximum of eight — as opposed to 16 — IOPs, a spokesman noted.

The basic VS 90 consists of the 32-bit CPU with 1M byte of main memory; a workstation/printer IOP that provides up to 16 ports; a disk IOP that can control up to four disk drives; a tape IOP that can control up to four tape drives; one three-port telecommunications IOP; an archiving workstation, used as an operator console; and Wang's VS operating system.

The VS 90 can be configured with up to 4M bytes of main memory and 2.3G bytes of on-line disk storage. It can also handle a maximum of 48 serial-type devices, a maximum of two disk IOPs and one additional tape or telecommunications IOP.

Software Compatibility

Since both the VS 90 and VS 100 run under the same operating system and support the same utilities, programs and media formats and files developed on one computer are compatible with the other, the spokesman noted.

In addition, the VS 90 utilizes Cincom Systems, Inc.'s Total data base management system and Wang's Mailway electronic mail and message system. The VS 90 is available immediately; a 1M-byte system costs $73,000. Monthly maintenance costs $450.

The entry-level system can be upgraded to the status of a VS 100 by adding a 32K-byte cache memory for an extra $30,000, the spokesman noted.

While bolstering its general-purpose 32-bit line, Wang also dropped prices on its main memory for both original and field memory upgrades. Previously, 1M byte of memory was priced on a sliding scale that ranged from $28,000 for 1M byte to $22,000 for 8M bytes. Now there is a flat cost of $16,000.

In addition, the company replaced two of its disk IOPs with "more differentiated" models that are said to feature increased functionality and are about $250 less expensive than their discontinued counterparts. The revised 22VO8A (which replaces the 22VO8) and the 22V28A (replacing the 22V28) cost $3,750 each and support the 75M-byte and 30M-, 60M- and 90M-byte fixed/removable disk drives.

Finally, Wang established a multiple-purchase discount policy for its 288M-byte disk drives that allows price cuts of 6% for purchases of from five to nine models and 10% for 10 to 19 devices. The single-quantity price of the disk drive is $23,000.

Wang is located at One Industrial Ave., Lowell, Mass. 01851.

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And in Thick of Dilemma

DP Workers in Thick of Polish Labor Struggle

By Bohdan O. Szuprowicz
Special to CW‡

Although the military crackdown in Poland has brought a blackout of information about its computer industry, it is well known that the Solidarity labor movement encompasses large numbers of data processing workers in all categories.

Groups within individual computer centers throughout Poland became active in September 1980, even before the nationwide Solidarity organization was formalized by the Communist regime. Twenty-six different computer centers in the Warsaw region met in Solidarity's first conference of DP centers in October 1980. The conference was held under the auspices of the prestigious DP Design and Applications Department (RCI-Cenplan) of the Central Planning Computer Center Group.

The most important items on the conference agenda were the proposals for a standard national pay scale for DP workers, demands for pay increases and the guarantee of minimum pay raises. Another pressing issue was the question of organizing a DP workers' section within the formal structure of Solidarity that would represent the specific interests of computer industry workers.

At that time, when DP workers within various enterprises were becoming members of a nationwide labor union, there were heated discussions whether they would benefit from such an association. Computers were often viewed as tools of the management that was being discredited in the eyes of the working masses.

Chapters Formed

At the start of 1981 more than 50 chapters of DP workers were formed in the Warsaw region alone; their membership of about 4,700 represented 54% of all such personnel in that area. Similar developments took place in Katowice, where 30 chapters were formed and 75% of the estimated 2,000 DP workers joined Solidarity. In Cracow, 20 chapters grouped 1,200 computer workers, and in Wroclaw, 18 chapters signed up 90% of all DP personnel in that region.

The pattern repeated itself throughout Poland within major computer centers of various enterprises, but almost immediately other organizations began recruiting computer workers as their rightful members and many inexperienced DP workers were undecided about which organization they should join.

Simultaneously with individual computer centers, Zeto, the national computer services network, began organizing local chapters of Solidarity within its regional computer centers throughout Poland. The rapidity with which this action took place necessitated the formation of a special committee to coordinate the emergence of Solidarity chapters within Zeto computer centers.

Of the total 6,200 employees of the Zeto network, 51% initially decided to join Solidarity; by the beginning of 1981, two-thirds of the Zeto work force had signed up.

The Central Statistical Office (GUS) of Poland, which runs another nationwide network of computing centers and employs 4,300 DP workers, registered 63% of its employees as members of Solidarity during the same time period. The ETOB computer services network, serving the building industry throughout Poland, claimed 68% of its 3,230 employees joined the new trade union.

The initial organizational phase of DP workers' unionization in Poland came to an end at the beginning of 1981, when the local chapters began to outline their long-term objectives for the Polish computer industry as a whole. But as the economic situation in Poland worsened and the number of Solidarity chapters in various industries increased, there was also a decline in use and interest in data processing within those industries.

The emerging workers councils in various enterprises, where the use of computers was previously mandated by administrative orders, viewed the machines and the computer workers with suspicion and regarded the computers as damaging or threatening to the future of their enterprises and the new order.

Besides Solidarity, other newly formed trade unions began competing for membership among DP workers in Poland. The Independent Informatics Workers Union and the Trade Union of Electrical Power Workers, claiming to represent the interests of the data processing industry, both recruited DP personnel to join their organizations.

Bitter Struggles

The only Polish computer magazine, *Informatyka*, started dedicating considerable space to the various DP workers' unions and their issues. Some of the statements and letters to the editors began reflecting the bitter struggles and chaotic conditions of the data processing industry in Poland.

Paradoxically, data processing in Poland during the last 16 months has found itself either ignored (at best) or attacked as an unnecessary tool imposed by incompetent central Communist authorities. By last May, yet another Polish Informatics Society had come into being, grouping professional computer scientists and engineers whose objectives were to preserve Poland's computer industry achievements and slow down the erection of barriers on the path of future DP development.

But the situation in the country was rapidly coming to a head. By midyear, *Informatyka* reduced its frequency from publishing monthly to only six issues per year. At the same time, its editors lamented the lack of involvement by Poland's computer workers in speaking out on the issues affecting the computer industry and their own future. Many enterprises used computers to check workers' attendance, performance, political beliefs and even religious practices and were in many cases viewed as government-controlled files that could be used against the workers when the need arose.

By Christmas it was all over. A state of war paralyzed Poland and General Jaruzelski issued a "work or die" order to Poland's workers in essential industries. And the centrally controlled computer centers specializing in population census and employment controls could probably electronically identify those nonworkers.

Report Details ATC Computer Plans

(Continued from Page 1)

with the expected growth in aviation in the next two decades. FAA projections show flights growing from 134 million in 1980 to 212 million in 1990 and 290 million in the year 2000.

While the study did not specify the type of computer equipment the FAA plans to acquire, according to the *Post*, one industry observer suggested that the agency may choose IBM's recently announced 3081 mainframes, which would comprise a "quantum leap" in processing power.

Calling for the "highest practical level" of automation, Helms' plan would convert many voice messages — such as weather reports — to data sent electronically to cockpit computer screens.

Individual radar consoles would get computing abilities of their own in an effort to reduce disruption caused by the failure of central computers. The plan would also upgrade backup systems and alarms that activate when planes are on a collision or near-collision course.

The "shrimp boats" now used by controllers — paper strips handmarked with flight data, long a source of annoyance to controllers — would be replaced by computer displays of the information, reportedly decreasing controller staffing requirements. The computers would also be able to expand an individual controller's airspace sector on command, allowing a smaller work force during off-peak hours, the study said.

After 1990, according to the report, the FAA would phase in a computerized service to analyze individual flight plans and select the most fuel-efficient and safest routes. Planes now waste fuel by flying diversions ordered by controllers who see the potential for a conflict at the last minute, the report stated.

The plan also calls for the merging of existing facilities around the country, the *Post* reported. The FAA's 20 Air Route Traffic Control Centers would be consolidated into 16 by 1990, while the more than 180 radar facilities at individual airports would merge into about 30 hub facilities, each serving more than one airport, by the year 2000.

In addition, about 1,200 of 3,000 ground radar, radio and beacon installations would be eliminated as newer equipment goes in. More than 300 flight service stations — which accept flight plans and provide weather information — would be absorbed into about 60 automated facilities.

The study claimed that "system errors" — inadvertent violations of aircraft separation rules — could be reduced by 80% between 1983 and 1985, when the new computers are expected to be fully installed.

While the study does not specify the cost of such a plan, FAA officials in the past have estimated a cost of $10 billion. And although the plan is being released in the midst of a belt-tightening phase of government, industry observers feel lawmakers would be willing to lay out the cash in view of the controllers' strike and publicity about the allegedly antiquated computer system.

Furthermore, the document claims that the changes would mean a $6.7 billion operating savings between 1981 and 1990 over spending that would be necessary if the present system was retained and $17.8 billion between 1991 and 2000.

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Export Ban Expected to Have Little Impact Here

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — President Reagan's ban on high-technology exports to the Soviet Union in response to martial law in Poland is expected to have little impact on the U.S. electronics industry because of the already low level of such sales.

Nevertheless, many industry representatives are dismayed at U.S. failure to get allies to participate in the sanctions.

Industry spokesmen contacted here uniformly expressed approval of the suspension of export licenses, but they also suggested that the move will do nothing or little to deprive the Soviets of high-technology products and know-how. Other Western countries will rush to fill the gap, they maintained.

"The sentiment is great," Alan Spurney, director of the Electronics Industry Association (EIA) International Business Council, said of the sanctions. "The U.S. certainly should do something to express its disapproval" of the allegedly Soviet-inspired imposition of martial law by Poland's government, he said.

But, he added, other countries, which have "no such moralistic compulsion . . . are just going to love the vacuum we leave."

No Great Loss

The Reagan administration is trying to obtain wider participation in the sanctions. Whatever its success, it is clear the vacuum of U.S. electronics sales to the Soviet Union lost by the White House action will not be great.

U.S. high-technology sales to the Soviet Union were already severely depressed before the Reagan action as a result of the export restrictions instituted by President Carter in January 1980 following the Russian military intervention in Afghanistan.

Sales of U.S. computers to the USSR, including peripherals and spare parts, amounted to approximately $3 million in 1981, according to Commerce Department figures, which are complete through October of last year.

As low as that figure is, it is almost 10 times higher than for all of 1980, when American firms exported $330,000 in DP equipment to the Soviet Union. After the initial restrictions were imposed by Carter, exports controls were somewhat relaxed later in 1980, which helps explain the big jump in exports between that year and 1981.

Even with that increase, however, U.S. sales are still minimal. In comparison, U.S. sales in 1979 were $22.4 million.

More significant is the fact that American exports to the Soviet Union over the last few years have been minimal in terms of total Russian computer purchases from Western sources. American allies in 1980 supplied almost $6 billion in computers and related equipment to the Soviet Union.

Because American firms account for far less than 1% of Western computer sales to the Soviet Union, their representatives are not particularly worried about the Reagan sanctions, but are exceedingly skeptical of their worth, given the lack of allied cooperation. "This is not dropping a bomb on the electronics industries," EIA's Spurney remarked. "It's a little bit of a hand grenade."

Echoing Spurney, Lloyd Kaufman, director of international programs for the Computer and Business Equipment Manufacturers Association, called the Reagan action "for all intents and purposes a reiteration of [existing] policy" that will have no real effect on the computer industry.

"We support the President," Kaufman said. "We are looking for multilateral support from our allies."

Statement of Support

Debra Demske, spokeswoman for the American Electronics Association, said the association "stands right behind President Reagan" and hopes for allied support. But, she observed, the sanctions are "basically the same" as imposed by Carter.

While the industry spokesmen were officially supportive of the Reagan move, privately other industry representatives were not so diplomatic. One called the action "very impulsive" and remarked that Reagan, by failing to get wider support for the action from U.S. allies, "screwed up on this one just like Carter did."

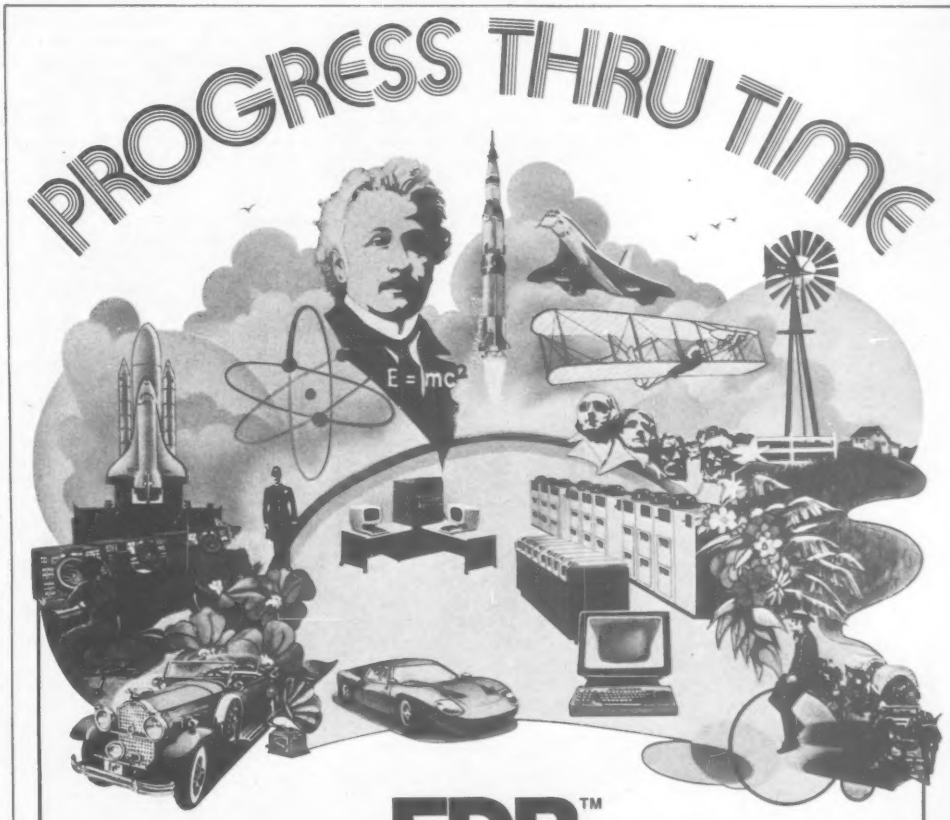
Some here also suggested these sanctions will be quietly relaxed some time soon, as was the Carter embargo of high-technology trade with the Soviet Union.

Two-Day Seminars To Scrutinize WP

MADISON, N. J. — Carnegie Press here is sponsoring a series of two-day seminars examining word processing from the DP manager's point of view.

The course will be offered in Tampa, Fla. March 11-12; in Los Angeles March 15-16; in San Francisco March 18-19; in Washington, D.C. April 21-22; in Boston April 27-28; and in Hasbrouck Heights, N. J. May 5-6.

The cost of the seminar is $595. More information is available from Carnegie Press at 100 Kings Road, Madison, N. J. 07940.



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DPers Falling Victim to Job Burnout Epidemic

(Continued from Page 1)

50% of U.S. corporate data centers, and by all accounts, the pestilence continues to spread unchecked, according to Don Berardo, a career therapist with the Meld Group, a Newington, Conn.-based consulting firm.

Berardo defines job burnout as a psychological malady that impairs an individual's ability to cope constructively with problems in the work place. Although nearly all occupational groups suffer to at least a certain extent from job burnout, the condition is believed to be especially pronounced among members of the computing field.

In many instances, job burnout results from a serious clash between the typical computing employee's basic personality makeup and the environment in which such an individual is frequently forced to work, Berardo explained.

Characteristic Profile

Although computing employees as a whole vary widely in their personality traits, the vast majority of the field fits a characteristic psychological profile. Most data center personnel, for example, are blessed with unusually high intelligence and creativity, but are often marred by rigid behavior, distrust of other people, lack of self-insight and resistance to change, according to Berardo.

Computing employees are also often distinguished by their low tolerance for both interpersonal intimacy and occupational stress, he added.

In a relaxed working environment, most typical information systems employees could probably go blithely about their business without ever once suffering any serious psychological ill effects. But in most large corporate computing facilities — which are characterized by rampant technological change, heavy user demand and tight production deadlines — programmers and other personnel of the same ilk are routinely subjected to pressures with which they are woefully ill equipped to cope.

This stark contrast between the computing field's classical personality type and the demands it faces in the work place often results in undue job stress, which can seriously undermine the quality of systems development work.

"Programmers are a little like artists who orchestrate a piece of music that will eventually be played by a computer," according to Jeff Kilpatrick, a personnel recruiter, who presently works for an Ann Arbor, Mich.-based search firm, Management Recruiters International, Inc. Kilpatrick will change his environment next week when he moves to Chicago for a position as head of DP recruitment for Bankers Life and Casualty Co.

"If you apply pressure to systems developers, they will still produce the desired music, but chances are that when it finally gets played it will sound all wrong."

Worker Indifference

Among its other undesirable effects, job stress often renders its victims indifferent to their work and lies behind much of the "goofing off," vandalism, lying, stealing and other destructive or antisocial behavior that increasingly afflicts U.S. corporate data centers.

Job stress also bears much of the blame for the computing field's notoriously high turnover rate, which is further aggravated by most employers' impulsive "knee-jerk" hiring practices, Berardo said.

Until fairly recently, the computing field cloaked itself in an almsot reverential aura of indispensability — an aura that made compulsive jobhopping and other excesses on the part of information systems employees an accepted but disruptive way of life.

'Megalomaniacal' Faith

For programmers and many of their data center colleagues, plummeting hardware prices and seemingly boundless market elasticity combined to create a feverish skilled-manpower demand that gave computing specialists a nearly "megalomaniacal" faith in their own self-worth and made employers willing to pay virtually any price to secure the workers' "invaluable" services, Berardo said.

But within just the last few years, the awe in which most lay managers have traditionally held their computing employees has slowly begun to evaporate and has triggered an incipient backlash that seems almost certain to give information systems hiring practices a long-overdue face lift.

Companies whose recruiting methodologies once bordered on the indiscriminate are now beginning to think twice before they commit themselves to acquiring new data center personnel, Berardo said.

Did You Hear the One About . . .?

By Jeffry Beeler
CW West Coast Bureau

A joke currently making the rounds in certain West Coast data centers tells the story of two information systems managers, both of whom suddenly died.

One of the managers went to Hell and lived happily ever after.

The other manager also went to Hell. He was there six months before he noticed the change.

Although it indulges in a little hyperbole, the joke illustrates a serious point: For many information systems directors, stress in the work place is fast becoming a way of life and is beginning to transform computing from a potentially rewarding field of endeavor into a kind of living prediction.

Job stress is frequently associated with the information processing field's middle and lower ranks, where many employees are routinely forced to contend with overwork, never-ending demands for improved productivity, short project deadlines and a pervasive sense of alienation from their companies as a whole.

But in truth, the people who are hit the hardest by job stress and its ill effects are often members of the computing field's upper echelons, especially information systems managers, according to Danville, Calif.-based consultant Gopal Kapur.

Unlike managers in most other business disciplines, data center directors are seldom allowed much influence or control over the significant forces within their professional domain. In general, they exert only minimal authority over their employees, many of whom intensely dislike taking orders and are quick to change jobs at the slightest offense.

Low Stature

Although they occupy highly responsible positions, information systems managers also typically enjoy less stature in their organizations than most of their counterparts in other departments. In addition, they frequently find themselves unable to evaluate and compare new vendor offerings, anticipate future hardware and software announcements or predict imminent changes in product support.

To make matters worse, the opportunities for venting accumulated stress are usually much more limited for computing department heads than for most of their subordinates. Programmers or systems analysts who can no longer tolerate their current working conditions usually have the option of pulling up stakes and moving to another company, which will almost surely welcome them with open arms.

However, at the manager's level, career mobility is usually fairly restricted. So when data center directors do switch jobs, the change is often drastic, Kapur said. "When programmers and systems analysts move from one company to another, they usually end up doing pretty much the same kind of task they did in their previous jobs," he explained.

"But when DP managers make a career move, they usually go into something totally unrelated to computers. For example, you sometimes see them doing things like running a KOA camp or buying a gas station."

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Manifestations of Stress

Jobs Taking Mental, Physical Toll on DPers

By Jeffry Beeler
CW West Coast Bureau

Mary, a project leader for a West Coast company's data center, first noticed the ache in her neck and back about two years ago.

By last April, the pain had grown so intense that it had robbed her of practically all her mobility and forced her to seek medical attention. The doctor who examined Mary (not her real name) found the muscles in her neck and back knotted like "little balls of iron" and quickly diagnosed the ailment as a symptom of on-the-job stress.

At first, the doctor urged Mary to change jobs, but when she balked at that suggestion, he wrote her a prescription for a widely used tranquilizer and advised her to seek professional counseling. Mary accepted the last piece of advice and, for the past few months, has attended weekly psychotherapy sessions to learn how to cope with vocational stress and improve her dealings with people.

She is also studying relaxation and biofeedback techniques in the hope of eventually controlling and minimizing her job-related anxiety.

Much of Mary's psychological stress — and its attendant physical symptoms — stems from her employer's constantly changing project objectives and from her futile efforts to make headway against a seven-month applications backlog.

"Sometimes, you just become overwhelmed and get the feeling that no matter what you do you'll never get to the end of it," she said.

Her ailments have been further aggravated by her computing shop's estimated 25% to 30% annual turnover rate, which is forcing her to continually readjust to new faces, personalities and working styles.

Mary's troubling case history is by no means unique. Each day, similar scenes of job-related pain and anguish are played out in corporate data centers throughout the U.S.

Hazardous Work Place

For Mary and thousands of systems specialists just like her, today's typical large-scale computing room is fast becoming a hazardous place to work. Huge backlogs, heavy production demands and countless other recurring hardships have become familiar fixtures on the information systems landscape and have transformed many corporate computing shops into stress-filled pressure cookers that are taking an increasingly heavy toll on their occupants' mental and physical health.

Throughout the information systems field and other sectors of the white-collar workforce, vocational stress has reached nearly epidemic proportions and has manifested itself in a wide variety of bodily and behavioral maladies, ranging from apathy to alcoholism and from backache to broken marriages. These and other job-related disorders bear at least part of the blame for the information systems field's dismal productivity record and, in some cases, are making even the simple act of coming into work each morning a figurative if not literal pain in the neck.

But although job stress poses serious challenges for the computing field and its members, the difficulties are far from insurmountable, provided an information systems manager knows what causes the disease and how to combat it.

Partial Solution

Part of the solution to the job stress problem is to get information systems managers and their subordinates to come together periodically in one-on-one employee review sessions, said Jeff Kilpatrick, a personnel specialist with Management Recruiters International, Inc., an Ann Arbor, Mich.-based search firm.

In theory, the employee review sessions should be scheduled as often as every three or four months and should serve two main purposes: to keep managers abreast of smoldering personnel grievances and to alert supervisors to recent changes in their employees' goals and interests.

The idea of holding periodic review sessions was also endorsed by Danville, Calif.-based consultant Gopal Kapur, who views the meetings both as a powerful career planning tool and as a mechanism for detecting and remedying job dissatisfaction before it gets out of hand.

Another way for computing shops to alleviate vocational stress is to insist on playing an early and active role in defining their systems requirements, planning departmental manpower and needs and setting project completion dates.

Many companies unwittingly run their computing departments into the ground by giving technically unsophisticated and incompetent users exclusive control over a new project's initial design and planning decisions. The result is often a back-breaking mismatch between a proposed application's intended scope and the time or manpower available for the system's development, Kilpatrick said.

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A Tough Choice for Users: System/38 or 4300?

(Continued from Page 1)

to System/38 processors to handle communications with a 370-era host.

In addition, the System/38 is not truly compatible with System/34 processors and some users reported that migration from a System/34 can be somewhat difficult. While IBM has announced a local binary synchronous communications (BSC) attachment, which allows one System/38 to be linked with another System/38 or a System/34 [CW, Nov. 2], code that runs on a System/34 will not run on a System/38 without some modifications.

The other logical migration to the System/38 is from the System/3. Hallaren said that conversion from that system is relatively easy.

More Models Expected

The System/38 family currently includes three models. The top-of-the-line Model 5 provides a maximum main memory of 2M bytes; the low-end Model 3 is available with a maximum 1.5M-byte main memory. The Model 4, introduced about six months ago [CW, June 22], has a maximum main memory of 2M bytes.

Analysts are sure that IBM will announce new models. Hallaren, along with Toronto-based analyst Ken Harvey, president of CSP, Ken Harvey, Inc. contends that the System/38 processor can potentially be expanded to become a far more powerful system than the 3081, currently IBM's largest processor.

But will IBM introduce new System/38 processors in time to meet users' needs? One System/34 user who is debating the merits of a System/38 Model 5 vs. a 4341-1, said it might be difficult to convince his company's executives to buy the top model of the former system without a clear indication from IBM that there will be more models to allow for upward migration.

Comparison With 4300

While the System/38 and IBM's 4300 line are vastly different in terms of architecture, they are somewhat similar in raw processing power. The entry-level 4321 is slightly more powerful than the System/38 Model 4, but offers half as much main memory. The 4331-11 goes head-to-head with the System/38 Model 5, offering slightly more processing power and the same maximum main memory.

The four larger 4341 processors offer from about 25% more processing power — in field-upgradable increments — to about four times the performance of the Model 5.

The 4300 line is broken into two segments; the dividing line marks IBM's distinction between a big and small processor. The low-end 4321 and 4331 processors are field-upgradable and the entry-level 4321 can be upgraded to a 4331-2.

However, 4331 users must swap processors in order to upgrade to a 4341 machine. Once at the 4341 level, users can migrate to 3033 or 3081 processors with little effort — at least in terms of software changes — but the 3033 and 3081 processors are liquid cooled while the 4300 family is air cooled. Conversion to the larger machines requires an investment of between $250,000 and $300,000 in plumbing costs, according to industry analysts.

Raw performance characteristics are not the only issue when comparing the System/38 with the 4300 series. The 4300 group is compatible with IBM's extensive library of 370-era software. It also offers a relatively easy migration path to IBM's top-of-the-line 3081 processors and the firm's newest operating systems, 31-bit addressing versions of the MVS and VM operating systems.

Some observers maintain that IBM, in order to cope with future processors that may be up to five times as fast as today's CPUs, must turn away from 370 software and move to newer software technology. Most agree that the extended addressing operating software, which moves IBM large systems from a 24-bit to a 31-bit environment, is a step in that direction.

In contrast, the System/38 currently employs a 48-bit architecture and Hallaren said that the operating system and microcode are designed as a 64-bit system. The implication is that IBM may eventually switch to a 64-bit architecture on larger System/38 processors, he speculated.

IBM reportedly designed the System/38 as a data base management system (DBMS) processor. It employs an object-oriented architecture, meaning data is stored more abstractly than in the traditional address-oriented 370 machines. According to an IDC report on the System/38 architecture, objects are high-level structured data types invoked through the control language. The control language can be used to create, delete, display and change the fields contained in objects. It can also be used to invoke other system services associated with objects, such as dumping and restoring, stopping programs and assigning access rights.

While lacking this object orientation, Hallaren contended that software available on 4300 processors — DL/1 and Structured Query Language/Data System, for example — provide capabilities similar to those offered by the System/38, at least from a user standpoint.

The sole complaint about the System/38 has involved failure to meet performance expectations with its Source Entry Utility software, according to IDC. IBM has reportedly solved that problem. But some users still maintain that the system is slow in multiple active-batch environments and when processing applications involving tape drives.

The System/38's object orientation may be a wave of the future. Analysts claim that IBM will redirect its large systems software to take on more

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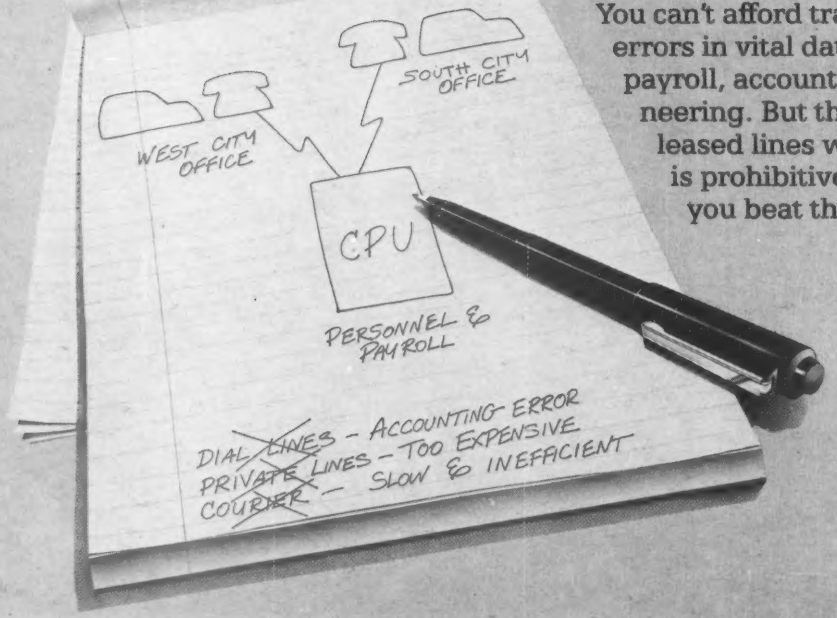

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System / Characteristics	System/38 Model 3	System/38 Model 4	System/38 Model 5	4321	4331-1	4331-11	4331-2	4341-1	4341-10	4341-11	4341-2
Relative Performance[1]	6.7[2]	9.6[2]	16[2]	11	11	16.5	22	40	34	50	66
Mips[2]	.11	.16	.28	.20	.20	.29	.40	.70	.64	.90	1.2
Memory Size in bytes (Min-Max)	512K-1.5M	512K-2M	512K-2M	1M	512K-1M	1M-2M	1M-4M	2M-4M	2M-4M	4M-8M	2M-16M
Purchase Price[3] (Memory Size)	$61,570 (512K)	$81,330 (1M)	$147,300 (2M)	$85,000 (1M)	$79,500 (1M)	$109,650 (1M)	$125,000 (1M)	$256,400 (4M)	$178,000 (2M)	$275,000 (2M)	$390,400 (4M)
Lease Price (Lease Term)	1,717 (2 Year)	$2,490 (2 Year)	$4,583 (2 Year)	None	$2,245 (2 Year)	$3,850 (2 Year)	$4,580 (2 Year)	$8,550 (2 Year)	$7,285 (2 Year)	$9,580 (2 Year)	$12,430 (2 Year)
Machine Cycle Time (Nsec)	1,100[4]	1,100[4]	600[4]	900[4]	900[4]	900[4]	900[4]	150-300	150-200	120-240	120-240
Channels (Min-Max)	1[5]	1[5]	1[5]	None	0-2	2	0-2	3-6	3-6	6	6
Cache (Buffer) Size	None	None	None	None	None	4K	8K	8K	4K	8K	16K
Bus Architecture?	No	No	No	No	No	No	No	No	No	No	No
Price per 1M Bytes Of Main Memory	$16,640	$16,640	$29,120	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000

Notes
1. CW estimates based on vendor-supplied information. Relative performance ratings are based on an IBM System 370/158-3 equaling 45. These numbers are designed to put the processor into perspective with other systems. It is not a buyers guide. All systems are not alike. They use different operating systems, instruction sets and architectures, and therefore cannot be directly compared. In addition, actual relative performance may vary with the application, peripherals and software.
2. CW estimates.
3. For processor only. Console and other prerequisites are not included.
4. Machine cycle time per four bytes.
5. System/38 has one internal I/O channel that can support multiple control units. Each control unit is capable of handling multiple devices of the same type.

A Comparision of the IBM System/38 and the 4300 Line

CW Chart

characteristics of the System/38. And Hallaren, as well as some vendors that offer a 370-compatible DBMS, contend that IBM could vastly improve the performance of its largest systems by switching to an object-oriented environment.

However, enhancements to 370-era software must be compatible with existing systems software, if IBM is to avoid the wrath of its large-systems user base. That may be a stumbling block. IDC's Will Zachmann speculated that MVS/XA (extended architecture) is a transition to newer software technology. But Ken Harvey pointed out that IBM cannot make a clean break with the past without creating some degree of incompatibility with 370 software.

If these analysts are correct, users switching to a 4300 processor rather than choosing a System/38 may eventually wind up employing a System/38 architecture anyway.

But the question of when IBM will get around to making major changes to the way MVS and other large-systems software operates is another issue. The MVS/XA operating system will not be available for approximately two years. And predictions are rife that an additional five years will pass before users make a complete switch to that operating system. Users deal with System/38 via the RPG-III programming language — a superset of the slightly older RPG-II available on IBM's System/3 and System/34. A superset of Ansi 74 Cobol is also available.

Users of the 4300, on the other hand, can run under a variety of operating systems and languages, from the distributed data processing-oriented Small Systems Executive (SSX) to the complex MVS.

In many ways, the System/38 vs. 4300 comparison is a "the grass is always greener . . ." type of argument. System/3 or System/34 users seem to look upon the voluminous 370-era software as having an advantage in flexibility. Some users trapped by that same software would like to have the architectural advantages of the System/38.

The bottom line is that a commitment to a System/38 requires some faith that IBM, and presumably others, will create additional software for the system and that IBM will announce larger System/38 models quickly enough to support users' needs.

It is impossible to make an absolute judgment as to which system is better. Different applications have different requirements. Analysts, consultants, users in charge of computer acquisition — all emphasize that the deciding factor should be how well a system fits a specific application. Its strengths or weaknesses in areas that are not critical to its intended purpose are relatively unimportant.

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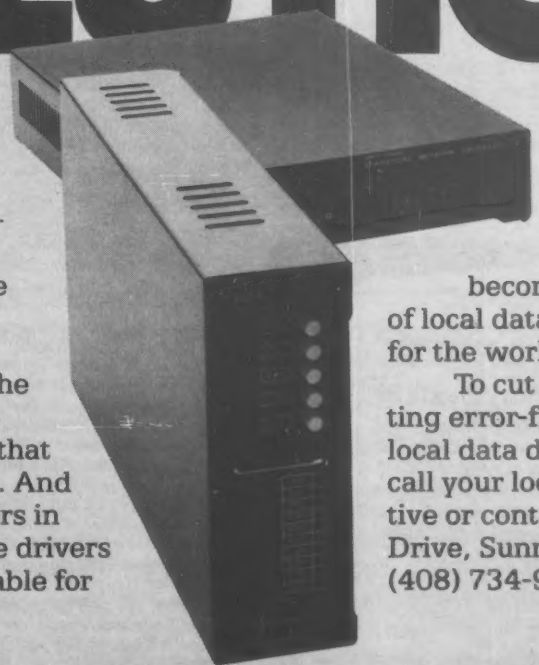

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Ecom: How It Works

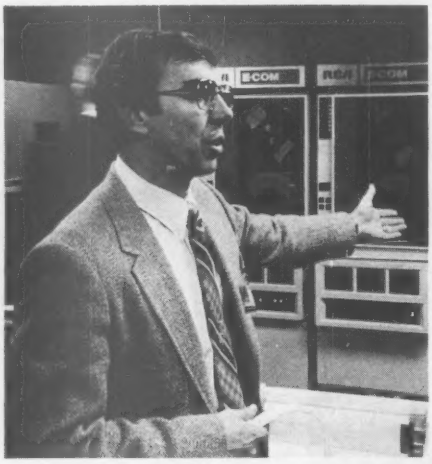
By Tim Scannell
CW Staff

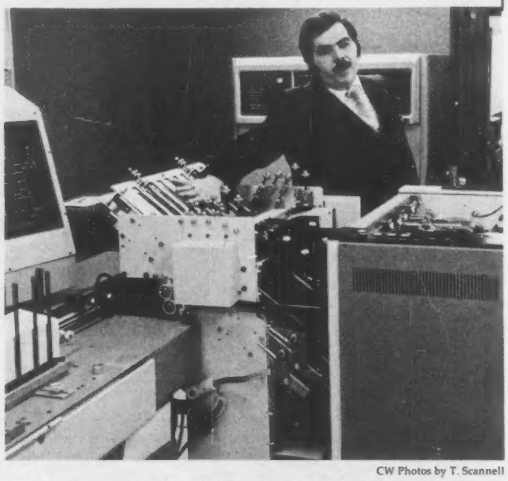
BOSTON — The post office is not getting into the telecommunications business, officials were careful to explain at the debut of the U.S. Postal Service's Electronic Computer-Originated Mail (Ecom) service here last week.

Rather, the Postal Service is merely following its legal mandate, as laid out in the Postal Reorganization Act of 1970, to explore any new technologies that help move the mail more quickly and at less expense to the consumer, Philip L. Sullivan, manager of the Ecom center here and postmaster of Boston, said.

The Boston Post Office is one of 25 serving post offices (SPO) around the country to which mass mailers can transmit messages for conversion into hard copy and subsequent delivery by letter carrier. Ecom made its debut at those 25 SPOs last Monday.

While Sullivan described Ecom as being a step below full electronic mail, he called it a "Generation II" mail system. In other words, it relies on the communications services made available by both the public and private telecommunications industry to complete its operation.





CW Photos by T. Scannell

At the Boston Post Office last week during the inaugural run of the U.S. Postal Service's Electronic Computer-Originated Mail (Ecom) service, Ecom coordinators Henry P. Son (left) and Frank Vetrano demonstrated how messages will be received by Digital Equipment Corp. computers, processed and then printed, folded and stuffed into first-class mail envelopes for shipping. There are 24 centers similar to this located throughout the country.

Advanced Deposit Account

To use Ecom, a customer first has to establish an advanced deposit account with the Postal Service and be assigned an access number. The advanced account consists of an annual fee of $50 as well as a deposit that will cover the cost of the messages to be sent — presently 26 cents for a one-page message and 31 cents for a maximum two-page message, excluding the cost of transmitting the messages to the SPOs.

After an account is established, a user can transmit a minimum of 200 messages to an SPO either directly via dial-up communications or through a dedicated carrier that leases an Ecom line. Messages can also be transmitted through a value-added carrier that will convert data to the appropriate Postal Service protocols and formats or consolidate messages for those users who do not meet the minimum message volume.

Customers who choose dedicated and value-added telecommunications methods must make their own transmission arrangements, Sullivan said.

Messages are received by a Digital Equipment Corp. PDP-11/23 processor, which formats and outputs the customer's electronic mail onto a magnetic tape. The magnetic tape is then physically removed from the PDP-11's tape drives — basically for security purposes — and placed on another tape drive connected to a DEC PDP-11/44 located in the same room.

Once the magnetic tape is mounted on the second computer — which is the main processing system — the machine checks the number of messages on the tape and communicates with a PDP-11/44 system in Wilkes-Barre, Pa. The third system is used strictly for administrative management and is linked to the computers at each of the 25 SPOs, Henry P. Son, an Ecom coordinator, explained.

If the administrative computer shows the customer has enough funds to cover the number of messages received, the SPO-based computer prints out the customer's messages on four Printronix, Inc. 300 line/min printers. The messages are then mechanically separated, trimmed, folded and stuffed into envelopes.

In the final step, the envelopes are entered into the regular mail stream as first class mail and sent to destinations served by that Ecom center, Sullivan stated. Because each of the Postal Service's 25 SPOs serve distinct areas of the country, electronically received mail originating from these centers will only be shipped first class from within these areas.

Batches of 200 messages or more received by the Boston SPO, but slated for the Los Angeles center, for example, will be electronically sent and then printed in Los Angeles.

Ecom's communications systems are provided by RCA Corp.'s Government Systems Division and can handle a variety of communications protocols, including those of DEC and IBM. Customer data can be received at transmission rates from 300- to 4,800 bit/sec.

Capacity Limitations

At its present capacity, each Ecom SPO can process about 1,000 to 1,200 letters an hour. However, the Postal Service plans to overcome that limitation by eventually replacing the current printers with high-speed laser-based models, Sullivan said.

The Ecom system is operational around the clock and is expected to serve at least 30% of the Postal Service's largest volume customers. By 1985, the system will probably be handling about 70 million pieces of mail per year throughout the U.S., according to Postal Service forecasts.

Ecom has a number of basic security precautions. For instance, access numbers are assigned to each user and separate computers are used to both receive and process messages.

To avoid any mix-ups before material is stuffed into envelopes and sent through the regular mail system, Ecom authorized workers even call a customer when a transmission is received to ensure that the batch of messages or bills was actually sent from that destination.

Although Sullivan basically defined Ecom as another product offered by the Postal Service, the electronic mail system does differ from other mail programs. For one thing, Ecom will not be subsidized by the federal government; it must be self-supporting.

For another, because at least 50% of Ecom is electronically based, a part of the operation is covered under the rules of the Communications Act of 1934. A sign is conspicuously posted in Ecom's Boston center stating that anyone who violates a message's confidence or removes a scrap of paper from the Ecom computer room will be subject to a $10,000 fine, two years in jail or both.

Once the messages are put in the bright blue and white Ecom envelope, they are considered as mail and covered under the standard postal regulations governing mail handling, an Ecom spokesman said.

ASM Schedules Annual Meet

CLEVELAND — The Association for Systems Management (ASM) will hold its 1982 annual conference in Kansas City, Mo., May 2-5.

The conference program reportedly will offer a mix of current data processing and systems topics, along with two special seminar series — "Systems Planning" and "Principles of Productivity." There also will be a two-hour audience participation program on management techniques.

Speakers include Laurance T. Burden, executive director of management information systems for Firestone Tire and Rubber Corp.; Charles A. Avera, director of corporate information systems planning for R.J. Reynolds Industries; Prof. F. Paul Fuhs of Virginia Commonwealth University; and attorneys Donald E. King and Kenneth J. Moran of McGuire, Woods & Battle in Richmond, Va.

Registration fee is $395 for ASM members and $495 for nonmembers. ASM is located at 24587 Bagley Road, Cleveland, Ohio 44138.

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Courts Nix Restraining Order

Postal Service's Ecom Opens for Business

By Phil Hirsch
And Tim Scannell
CW Staff

WASHINGTON, D.C. — The U.S. Postal Service's much debated electronic mail service went on the air last week as promised, after two federal courts refused to issue the temporary restraining order requested by the Department of Justice.

But the future of the Electronic Computer-Originated Mail (Ecom) service remains uncertain. This week, the U.S. Court of Appeals here will begin considering whether to permanently enjoin the new service.

Ecom permits businesses and other heavy mail users to transmit 200 messages to a serving post office (SPO). Thus far, the Postal Service has established 25 SPOs throughout the country equipped with the necessary computers, printers and communications devices necessary to handle the Ecom load.

Additional Charge

At the SPOs, the messages are converted into hard copy and delivered to the recipient by letter carrier. The Postal Service charges 26 cents for converting and delivering a one-page message and 31 cents for two pages. This is in addition to the charge for transmission service, which is provided by commercial carriers.

Since each transmission must contain at least 200 Ecom messages, the service is of interest primarily to bulk mailers, although a number of middlemen are offering to aggregate messages from firms with smaller volumes.

To date, Digital Equipment Corp. — a major Ecom equipment supplier — is the only firm that has received certification from the Postal Service to use the service. The computer manufacturer reportedly plans to begin using the system within the next 60 days.

At least 37 other companies across the country have applied to the Postal Service for Ecom certification, including General Tire and Rubber Co., Shell Oil Co. and Merrill Lynch Pierce Fenner & Smith, Inc.

However, although enthusiasm among the business community is high, the Justice Department believes that the Postal Service may have jumped the administrative gun in its quest to electronically zap the mail to various Zip Codes.

The main bone of contention between the Justice Department and the Postal Service is whether the U.S. Postal Rate Commission must approve Ecom as presently configured before it can be operated on a permanent basis.

In 1979, the Postal Rate Commission approved an "experimental" offering, but this was struck down last May by the U.S. Court of Appeals; the court then remanded "the whole matter" to the commission. It has been questioned whether that phrase meant the court was telling the commission merely to authorize a permanent service, as the Postal Service claims, or was saying the commission should reconsider the whole justification for Ecom, as the Justice Department and numerous vendors of commercial electronic mail services maintain.

Ecom critics also contend that the service, as presently implemented, is far different from what the Postal Rate Commission approved in December 1979.

According to the commission, the service now appears to require a capital investment of $38.6 million, about five times the amount estimated in 1979. Ecom rates have not been adjusted upward, however, which bothers commercial electronic mail service vendors, especially since their rates are substantially higher than 26 cents to 31 cents a message.

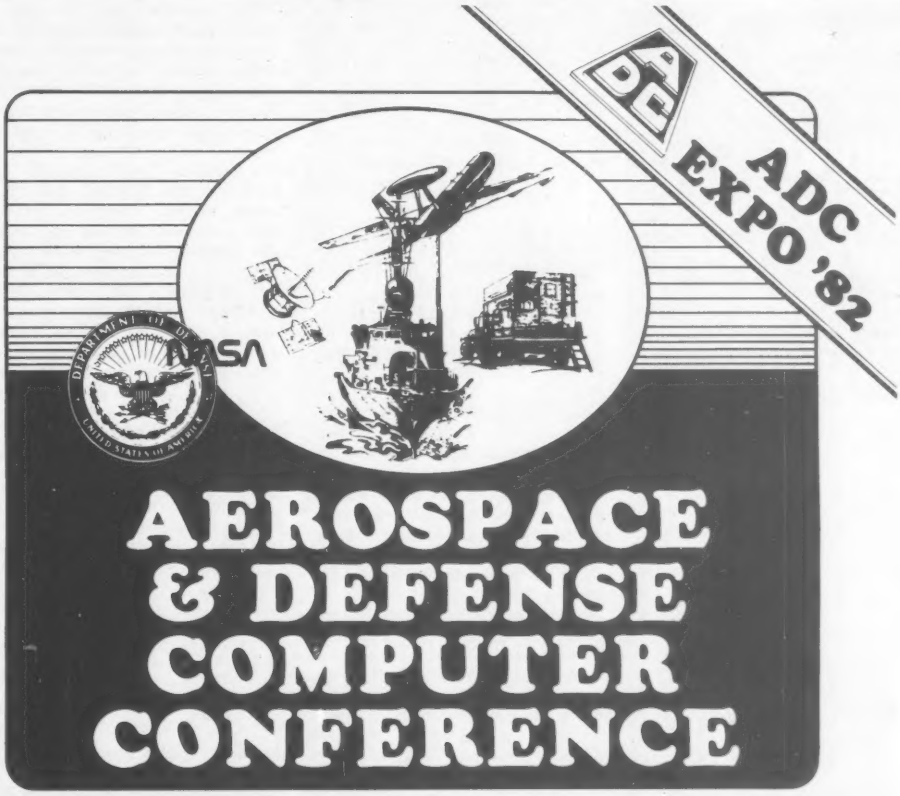
Another concern is that the Postal Service, once Ecom is firmly established, may establish its own communications network and shut out the commercial carriers who are now transmitting messages from each sender to each SPO.

Corrections

In the Dec. 7, 1981 In Depth, "Planning for Office Automation," the biographical data on Carolina Watteeuw stated that she has been a consultant to Data Equipment Corp. This should have read Data Engineering Corp. (Belgium).

The package for investment tax credit sales analysis that runs on the Dartmouth Time-Sharing System (DTSS) [CW, Dec. 7, 1981] is available from the package's developer, Corporate Time-Sharing Services, Inc., 30 Rockefeller Plaza, New York, N.Y. 10112, not from DTSS.

In "There's Rejoicing in Temple Since Fred Joined the Flock" [CW, Dec.14], it was reported that the City of Temple's Local Government Administration Software (Logas) was written by Sperry Univac. In fact, the software was written by the city with help from the mainframe company.



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Three More Join FCC Line Applying for Dems Licenses

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — RCA, Western Union and a newly formed subsidiary of Control Data Corp. have requested authority from the Federal Communications Commission (FCC) to build and operate extended digital electronic message services (Dems) nationwide.

Nine other firms previously filed requests for FCC permission to build Dems. Each company wants to provide all-digital, two-way local loops operating at up to 1.544M bit/sec in more than 30 of the nation's largest metropolises.

So far, however, the FCC has allocated only seven channel pairs for extended Dems. Six other pairs have been earmarked for limited Dems networks, which would operate in a maximum of 30 cities. The first two applications for these licenses were filed early this month.

FCC to Decide

Since most of the Dems applicants already own long-haul transmission facilities and/or provide on-line services, which can be transferred to their proposed networks, at least part of the start-up problem is already solved.

But until the FCC decides how it will select seven lucky extended Dems carriers from among the 12 who have filed, implementation of the new service will be delayed. Last week, a commission spokesman said an allocation plan has been tentatively worked out. He expects it to be announced before the end of January.

Like earlier Dems applicants, the latest ones plan to offer two basic categories of service — low speed, up to 2,400 bit/sec, and high-speed, 4,800 bit/sec and above.

The former were designed for time-sharing and data base retrieval applications, the latter for on-line document distribution, word processing, computer-to-computer file transfer and similar multi-megabit operations.

RCA, which plans to build a 50-city Dems network, said that six months after receiving the FCC's blessing it plans to have digital microwave local loops — officially known as digital termination systems (DTS) — operating in Atlanta, Chicago, Houston, Los Angeles, New York and San Francisco. The application was submitted by RCA Network Services, Inc., a recently created subsidiary. The company indicated that its plan to build a Dems network depends at least partly on an "in-depth analysis" of AT&T's recently announced Advanced Communications System (ACS).

CDC Facilities

Data Source, Inc., the Control Data subsidiary, is also proposing a 50-city Dems net, consisting initially of three metropolitan areas — San Jose, Calif., Minneapolis and Cleveland. Service is projected to be available initially in the first quarter of 1984. CDC, which has major installations in each of the three cities, will not only be a customer of the Data Source Dems net, but its existing packet-switched private data communications network will provide some long-haul transmission facilities needed by users of the new service.

Western Union proposes to begin its Dems operation in six metropolitan areas — Washington, D.C.; Boston; Detroit; San Francisco; Los Angeles; and New York City. Access to TWX/TLX subscribers throughout the nation will be a "special feature" of the telegraph company's offering.

Locate Net

Local Area Telecommunications, Inc. (Locate) is a newly formed, New York-based partnership between Kenneth M. Curtin, a venture capitalist, and Telecom consultant Douglas Lapin. Both are said to have in-depth telecommunications backgrounds — Lapin as a senior analyst and management consultant for Probe Associates, Curtin as a systems designer/manager at Ambac Industries, Inc. and RCA.

Locate plans a 15-city network, to begin in six cities (San Francisco, Dallas/Fort Worth, Stamford, Conn., Los Angeles, Chicago, and New York). Initially, transmission at 448K bit/sec is planned, but through the use of new technology the company promises 1.544M bit/sec within 18 months.

Via/Net, the other applicant for a limited Dems license, now operates a telephone message call-forwarding service in San Diego. The company plans to establish DTS there, as well as in Los Angeles, Orange County (Anaheim) and San Bernardino-Riverside. Voice, as well as data transmission, is planned, according to a spokesman.

Currently, he explained, Via/Net digitizes its customers' voice messages before storing them for later delivery. The company's proposed Dems network would permit these messages to be forwarded, in digital form, from each of the four service areas to any of the others.

SBS Wants to Become International Carrier

CW Washington Bureau

WASHINGTON, D.C. — Satellite Business Systems (SBS) requested permission from the Federal Communications Commission last week to become an international communications carrier.

The company has already worked out a deal with British Telecommunications, the UK telecommunications authority, to provide digital data transmission, digital facsimile transmission and analog teleconferencing services between this country and the UK. They are planned to begin in the fourth quarter of this year.

The proposed teleconferencing service will be the first linking viewers in the two countries, he added. The digital services will operate initially at speeds of 2,400 to 56K bit/sec; rates up to 1.544M bit/sec will be available later.

Similar arrangements with other countries are "contemplated," said the spokesman, although no negotiations are currently under way. He specifically mentioned Japan as a likely candidate.

Reagan Gives Western Union Status as IRC

CW Washington Bureau

WASHINGTON, D.C. — With the stroke of a pen, President Reagan converted the Western Union Telegraph Co. into an international record carrier (IRC) earlier this month, lifting a barrier imposed 38 years ago.

Reagan signed S. 271, the Record Carrier Competition Act of 1981. After a long, often bitter fight between Western Union and three of the nation's long established IRCs — ITT World Communications, Inc.; RCA Global Communications, Inc.; and Western Union International, Inc. —antitrust suits were filed by each of the latter carriers against Western Union and it contersued.

Recently, Western Union and Western Union International settled their differences. The battles between Western Union and the other two carriers continue, but it appears likely they will also be settled out of court.

Besides adding another carrier to the international market, enactment of S. 271 has helped to increase competition in the domestic telecommunications market.

Last month, the Federal Communications Commission (FCC) authorized the five major U.S. IRCs — TRT Telecommunications Corp. and FTC Communications, Inc., plus the three named earlier — to provide wholly domestic record-type communications service between their network switching centers and "hinterland" points of operation. The IRCs had proposed to offer such services as telex, facsimile, data transmission and leased teleprinter channels.

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'A Kind of Esperanto'

Pentagon Protocols Seen Mixed Blessing for IBM

By Brad Schultz
CW New York Bureau

The Defense Department protocols just betrothed to Ethernet and expected to arrive with many popular mainframes in a year or two, give IBM something to fear and something to cheer about, Prof. David J. Farber told *Computerworld* recently. The University of Delaware professor of electrical engineering and computer science plays a key role in efforts to implement the Pentagon's Transmission Control Protocol (TCP) and Internet Protocol (IP) with X.25, the protocol run by public data networks around the world [CW, Dec. 21, 1981].

According to Farber, a noted authority on message networks who helped design AT&T's first electronic switching system, IBM may fret over TCP/IP because the protocol pair will make it far easier for IBM customers to communicate with mainframes sold by IBM competitors.

The competition has already delivered systems that reliably talk with IBM processors, Farber observed, but differences between the architectures — hierarchies of protocols — for each hardware brand have made protocol and data format conversion plus response time degradation a heavy price to pay for such channels.

Software Would Pay Its Way

TCP/IP software would reside in mainframes or front-end processors associated with each architecture in a multivendor setting. The software would pay its way in storage space and execution overhead by eliminating the need for much protocol/format conversion, Farber said.

At MIT's Laboratory for Computer Science, the person who now directs TCP/IP development on behalf of the Defense Advanced Research Projects Agency called TCP/IP "a kind of Esperanto" for computers.

Analagous (in rough terms) to the language proposed as a universal medium for human discourse, TCP/IP would ideally be the universal medium for communicating processors, principal research scientist David D. Clark told CW.

Using this metaphor, data traffic (without benefit of TCP/IP) between a network under IBM's Systems Network Architecture (SNA) and a network under Digital Equipment Corp.'s Decnet would compare to voice traffic at the United Nations, where a speech in French would need intermediary translation before a listener who only knows English could understand the speech.

Farber and Clark agreed that a nearly universal proliferation of TCP/IP among data communications users would seriously cut demand for certain IBM software and for software turned out by many suppliers for major network architectures.

The threatened software supports middle layers of conventional architectures, where TCP/IP would simplify procedures for splitting messages into datagrams, appending address information to ensure the datagrams reach their intended destination and information needed to reconstruct messages at the receiving end. TCP/IP would also improve techniques for gauging traffic flows so as to avoid swamping buffers along the way.

But Farber added that TCP/IP will create the need to revise or replace existing software that supports the highest layers of conventional architectures. More changes would be necessary in "richer" processing environments (where processing is especially complex) than in "poorer" environments, Farber stated.

Coming Defense Department requirements that systems sold to the military feature TCP/IP, during an era of unprecedented spending on military systems, could effectively standardize the middle-layer protocols of major architectures, including SNA, Farber pointed out.

Professionals "could argue until the cows come home" about slight differences between the Pentagon's model for communications among different hardware brands and a model recommended by the National Bureau of Standards, he remarked, but standardization for the sake of standardization is likely to override such squabbles eventually.

If TCP/IP will allow IBM customers to more easily communicate with non-IBM computer systems (therefore reducing a user's dependence on IBM), what would give the world's largest mainframer cause to cheer about the protocols? The Defense Department contributions will also allow traditional non-IBM customers to easily reach IBM equipment (therefore building demands for IBM products in some quarters), Farber declared.

Prof. Lists Three Reasons for Watching Csnet

By Brad Schultz
CW New York Bureau

NEWARK, Del. — Data communications users have three important reasons to follow development of the Computer Science Research Network (Csnet), a National Science Foundation (NSF) project administered from the University of Wisconsin at Madison, but heavily influenced by University of Delaware's David J. Farber, professor of electrical engineering and computer science [CW, April 27, 1981].

The most important reason, which extends to the entire computing community, is probably that Csnet is a bold effort to save academic programs in computer science [CW, April 6, 1981].

Obsolescent campus computing facilities and salary differentials between academia and industrial research centers have left academic computer science programs ill-equipped — in equipment and staff — to meet the soaring demand for instruction.

NSF Backing

The NSF gave a research team nearly $5 million to develop Csnet as a way for educational institutions to share computing resources. Much of Csnet traffic is expected to be electronic mail, similar to the research correspondence routinely passed through the Pentagon-sponsored Arpanet. In fact, Csnet will eventually latch on to Arpanet.

Besides the fact that Csnet may help ease the shortage of technical professionals by improving capacity to train future professionals, the network is important as a test bed for technology that may reduce dependence on value-added networks.

Farber is directing development of Phone-Net, one of Csnet's four major component services. A telephone-based "occasional mail" system, Phone-Net may reduce the cost of service for which GTE Telenet Communications Corp. presently charges $1,500/mo to $2,000/mo clear down to $100/mo to $150/mo, Farber told *Computerworld*.

Eight Phone-Net nodes should be running by Jan. 15, with as many as 40 due to begin by March 30. What works for the universities could work for commerical users, the professor pointed out.

A second component of Csnet relates to the third reason why the NSF project warrants the attention of data communications users. This service for host-to-host communications among previously incompatible hardware brands will implement — for the first time in a conspicuous domain outside U.S. Defense Department environments — the Pentagon's Transmission Control Protocol (TCP) and Internet Protocol (IP) with X.25, the recommended standard for links between data terminal equipment and public data networks.

The TCP/IP/X.25 service should cut over in the next six months to a year, Farber said. Arpanet cutover to TCP/IP is slated for Jan. 1, 1983 [CW, Dec. 14].

The third Csnet component service is a restricted (mail only) time-sharing service in which users employ terminals (at universities that cannot afford much else) to reach a Digital Equipment Corp. VAX system that "front ends" the Telenet packet net.

The fourth Csnet service employs a VAX in locating resources on the other side of Csnet that can resolve a user's problem.

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U.S. Stance on Data Flow Called 'Nonsense'

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — "Nonsense."

That is what a Canadian government official branded American arguments for free speech and human rights as they relate to transborder data flow, arguments that, he said, serve only to mask the basic commercial interests of those involved in modern international services.

Addressing a recent symposium on communications and international trade, Dr. Elizabeth Kriegler of Canada's Department of Communications said Canada will work with the U.S. for a fair technological relationship. But Canada's first concern, she said, must be to prevent the transfer of "substantial economic activity" outside of the country through new technology.

Kriegler's "view from abroad" was supported during the symposium by another speaker, William Gaillard of the European Community's delegation to the U.S., who said that, like Canada, European nations know their future economic health depends on a strong and independent high-technology capability.

Their remarks served to illustrate how little headway U.S. negotiators have made in trying to persuade American's trading partners that freedom of speech and free flow of information are basic American principles, not easily bartered away in international debates on transborder data flow. Americans, for their part, continue to display skepticism about foreign claims that data movement must be closely regulated, if not restricted, in order to protect fundamental personal privacy protections.

It is time to correctly identify what we are talking about in these debates, Kriegler said. "These are goods and services," she maintained, adding that while technologies may raise human rights issues, their products have quantifiable value and are subject to basic laws of supply and demand.

Real Issue

"Let's drop all this nonsense about human rights," she said. The real issue is jobs and national sovereignty, according to the Canadian official, who noted that against the present "rather gloomy economic background" of low productivity and high unemployment, sophisticated DP/telecommunications industries are "one life raft in the storm."

Canada must insure all sectors of its economy have access to reliable, advanced telecommunications services and will move deliberately, if sometimes slowly, in that direction, according to Kriegler, who chairs a government interdepartmental committee on transborder data flow.

Canada does not want to make the same mistakes in these technological industries that it made in other, manufacturing sectors, which are now heavily controlled by foreigners, she said. In effect, Canada does not want to "trade away the farm" before it knows what it has.

The country has "very little experience to guide us in these new areas. The legal framework is hopelessly inadequate," Kriegler added, saying "at the very least we are groping" with these new technologies and their international ramifications.

While "our collective ignorance in many areas" may make Canada lag behind the U.S. in DP/telecommunications applications, it would not be the first time Canada has failed to keep pace with the U.S., Kriegler said. But she assured the symposium that the close U.S./Canadian social, economic and cultural ties will necessitate a satisfactory accommodation of the two nations' competing interests. For the present, she said, "knee jerk reactions do not make any of us better off."

Similary, Gaillard, presenting a European point of view, said that while European nations intend to abide by existing trade agreements, "it is very important to us to establish Europe as a center for the development of these technologies and [their] use."

The economic needs of the European Community's 10 members dictate independence from Japanese and American equipment and services providers, according to Gaillard, who noted the 10 countries currently do not have a unified telecommunications network.

"Europe cannot afford the luxury of diversity" Gaillaird said, arguing that Americans, who already enjoy a far-reaching telecommunications network cannot appreciate the problems caused by so many European countries operating individual networks in such a small geographic area.

Estimating development of a single European data network by the end of the decade, Gaillard said Europeans are not trying to close out foreign competition so much as they are trying to catch up with foreign competitors.

However, Gaillard's and Kriegler's presentations did little to assuage the worries of American participants at the symposium, several of whom noted that for all the protestations of international goodwill, there are no international agreements covering much of these technological issues that the U.S. can rely on to resolve disputes with Canada and European countries.

It was also suggested that attempts to create a European network, as described by Gaillard, could move European nations so far away from use of international technology standards as to effectively preclude any American or Japanese participation or interconnection in the near future.

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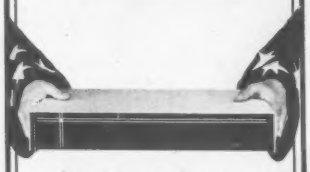

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Strike! Foul!

Computer Seen 'Stooge' in Baseball Rankings

By Bruce Hoard
CW Staff

NEW YORK — Thinly veiled inferences that a computer here struck out in rating major league baseball players are definitely foul. In fact, the reasoning behind the innuendos is about as clear as the infield fly rule.

According to a story that appeared in the Dec. 20 edition of the *Atlanta Journal-Constitution*, the Elias Sports Bureau of New York produced a computerized, 40-page report ranking players for the 26 major league baseball teams.

True.

The story noted that the report ranked Pete Rose *17th* among first basemen in both the American and National Leagues and stated unabashedly the Los Angeles Dodgers have three starting pitchers better than rookie sensation and Cy Young Award winner Fernando Valenzuela.

It did.

The story went on to condemn the "obvious misjudgments" that could lead to such egregious declarations.

True again.

What the story does not tell the reader is that the computer used to "rank" the players was little more than a willing stooge for major league players and owners who supplied it with the damning data it was obliged to digest and expectorate.

Information Clearinghouse

For the record, the Elias Sports Bureau of New York is a sports information clearinghouse that maintains data on professional baseball, football and basketball for dissemination to such clients as the teams themselves and the media.

In this particular case, Elias was asked to evaluate statistical data supplied to it by the owners and players relations committee during last summer's abortive baseball strike. The results were to be used in establishing a compensation system to cover the loss of players to other teams via free agency, according to an Elias spokesman.

"We didn't rate players to see who the best ballplayers were," he explained. "It was never intended to say this guy is the best ballplayer in baseball and that guy is the second best. The guidelines were given to us. We just wrote the program."

In addition, he noted, the rankings were never intended to be released, but became part of the public record after they were leaked to the press.

Peter Hirdt, who along with Chris Thorn wrote the program to evaluate the data, explained some of the criteria involved with the software, which was written in Basic Plus 2 and run on the firm's Digital Equipment Corp. PDP-11 computers.

As determined by the players and owners, batting prowess was judged by average, number of times on base, home runs, RBIs (runs batted in) and plate appearances. These statistics were straightforward.

Tripped by Outfielders

But things began to get dicey when considering the criteria used to evaluate outfielders' fielding ability — there was none. On that basis, the most errant, klutzy outfielder who ever tripped over his own shoelace shares equal billing with Fred Lynn.

The players and owners justified this omission by rationalizing that outfield errors are subject to the whims of official scorers, Hirdt said.

Evidently those same official scorers become more perspicacious when judging infield action because the criteria for evaluating shortstops and second baseman included errors, he added.

What did the players think of the ratings?

Ray Grevey, director of player relations and the point man for their position during the protracted negotiations last summer, was asked the question.

"I can't answer for the players, I know the players association agreed to the system and it's included in the collective bargaining agreement," he replied.

As it turned out, the "obvious misjudgments" were perpetrated by the players and owners in the first place and then accepted by them and put into practice as part of a historical labor agreement.

The computer did a good job. It took the people who provided the rating criteria to muddy the system.

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House Report Claims USPS Overstated Savings of Zip +4

CW Washington Bureau

WASHINGTON, D.C. — Savings the U.S. Postal Service (USPS) expects from its proposed nine-digit Zip Code program would be all but wiped out by revenue losses from the rate discount through which the service hopes to induce mailers to use the longer numbers, a House of Representatives subcommittee said recently.

A report from the House Government Operations Subcommittee on Government Information and Individual Rights estimated that postal savings through use of new automated equipment alone would not be increased through the additional introduction of the Zip + 4 program. Moreover, the USPS projections do not include the cost to the private sector to convert to the longer Zip Codes — costs that various estimates put as high as $1 billion.

"In an effort to still opposition to and gain support for its plan to lengthen Zip Codes to nine digits as it automates the mail sorting process, the Postal Service has repeatedly overstated and misrepresented the benefits that might accrue to it," the report charged.

Specifically, the report said the Postal Service expects to realize a 48.5% return on its $900 million investment in new automated sorting machines if the nine-digit Zips are implemented at the same time. Without the new Zips, according to the USPS, the return on the automation alone would be only 22%.

The Postal Service has proposed a half-cent discount for every piece of first-class mail carrying the new Zip Codes. The discount proposal was withdrawn after Congress delayed implementation of the Zip + 4 program until Oct. 1, 1983.

The subcommittee study suggested the rate discount would have to be increased over time to match inflation, but said that even using the original figure Postal Service losses would approach $150 million a year from the discount. When that sum is factored into the USPS cost-benefit analysis, the subcommittee said, the return on investment for automation plus longer Zip Codes drops to about 22%, or equal to the return the service could expect through automation alone.

Subcommittee Chairman Rep. Glenn English (D-Okla.) said the report was prepared to assist the General Accounting Office, which is looking into the Zip + 4 proposal to advise Congress on whether it should allow USPS to go ahead with the program in 1983.

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Former IRS Commissioners Oppose Easing Data Access

CW Washington Bureau

WASHINGTON, D.C. — Former commissioners of the Internal Revenue Service (IRS) have come out strongly against proposals to ease law enforcement agencies' access to IRS data banks for investigating and prosecuting nontax-related crimes.

The "IRS lacks the resources to do its own job and also serve as the government's general-purpose law enforcement agency," former Commissioner Donald C. Alexander told a House Ways and Means subcommittee recently.

The subcommittee is considering legislation to amend the 1976 Tax Reform Act, which set privacy safeguards for tax return information. The legislation, supported by the Reagan administration, would make it easier for law enforcement officials to request and for the IRS to release tax information for criminal investigations [CW, Nov. 16, 1981].

Backers of the legislation argue organized crime members and drug peddlers are escaping prosecution because IRS agents cannot reveal incriminating evidence uncovered while administering the U.S. tax system. However, the bills are strongly opposed from several sides as constituting a large threat to privacy and the integrity of the U.S. tax system.

Alexander, for example, said the administration should stop trying to reduce the funding of the Drug Enforcement Administration if it wants better enforcement of drug laws. "Tax returns and tax agents should not be used as a substitute for nonuse or misuse of existing law enforcement tools," he said.

Similarly, former IRS Commissioner Jerome Kurtz said the proposed legislation "would seriously interfere" with IRS duties. "I am afraid," he said, "that the proposed amendments would inevitably divert some agents' attention from their main function of tax administration to digging around in taxpayers' records looking for interesting tidbits of information to refer to the Department of Justice."

Calling such a development "a vast misuse of government power and resources," Kurtz said, "our tax system can only work with the general acquiescence of taxpayers. That acquiescence requires confidence that the Internal Revenue Service is in the business of enforcing tax law and is not a stalking horse for every prosecutorial agency in the government."

Science Adviser Predicts R&D To Gain Private-Sector Funds

WASHINGTON, D.C. — Federal support for computer science and other engineering sectors, as well as for basic research and development (R&D) activities, including microelectronics and telecommunications programs, is threatened by President Reagan's budget-cutting efforts, a White House science adviser said recently. He added that marketplace economics will ensure continued healthy American science and technology.

"We cannot realistically expect to accelerate spending for R&D in a period of fiscal austerity," Dr. George A. Keyworth II, director of the White House Office of Science and Technology Policy, told a congressional committee recently.

Addressing the House Science and Technology Committee, Keyworth predicted the latest tax cuts and reductions in federal regulation will stimulate the U.S. private sector to devote additional billions of dollars to R&D. "Considering the magnitude of the overall budget cuts I believe that most R&D, especially the research area, has fared quite well."

Despite strong assertions to the contrary by other witnesses at the hearing, Keyworth said "even in a period of affluence and sustained economic growth, throwing money at problems has not proven to be an effective strategy." Calling the condition of U.S. science "generally healthy," particularly in such areas as microelectronics and communications, Keyworth proposed a federal role in R&D "appropriate for the 1980s."

"There are a number of good reasons why we cannot expect to be preeminent in all scientific fields, nor is it necessarily desirable," he explained. This is not "defeatist; rather it is a recognition of the realities of today's competitive world.

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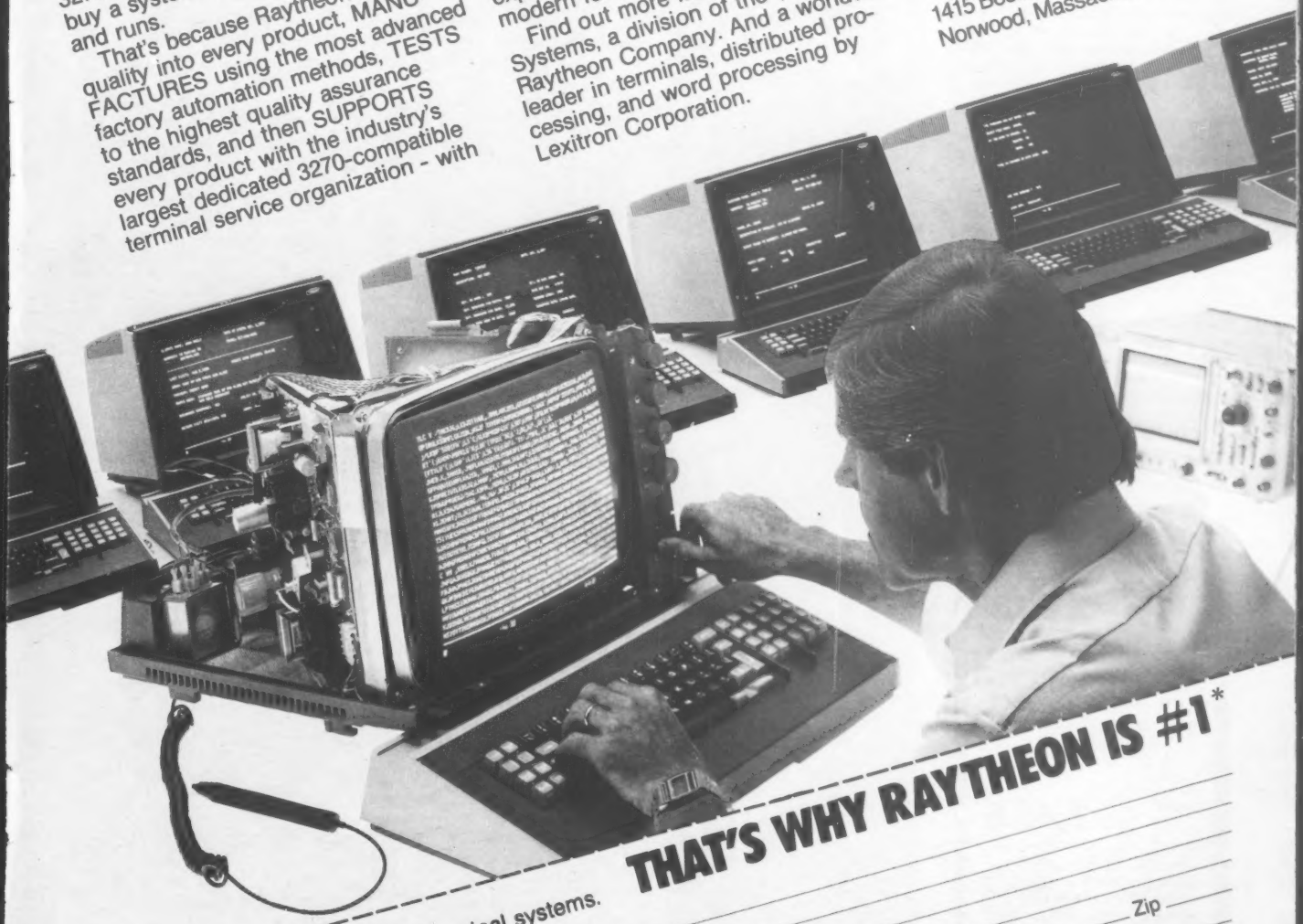

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Parents of Missing Children Seek National Net

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. — A group of parents whose children have disappeared or been murdered has called on Congress to establish a nationwide computer clearinghouse to help find missing children and identify bodies.

At a recent Symposium on Exploited and Victimized Children held in Louisville, Ky., a panel of such parents told their tales of personal woe to an audience of about 200. Also speaking at the conference, sponsored by the U.S. Department of Justice and four other organizations, was Sen. Paula Hawkins (R-Fla.), sponsor of the proposed Missing Children's Act, which would mandate that all missing children's names be entered into the FBI's national computerized Missing Persons File.

"Currently it is a voluntary system as far as entering missing children's names into the computer system," explained Tina Evans, press assistant to Hawkins. "It is said that only 10% of the estimated 1.8 million children who disappear every year are reported to the FBI," she added.

The 1.8 million figure includes runaways and parental kidnappings, although "several individual sources" indicate as many as 50,000 children disappear annually as true victims of "stranger abduction," Hawkins explained.

Many of the missing children's names are retained only by their local police departments, which often assume they are runaways when actually they may have met with misfortune, Evans pointed out.

More Attention

"A stolen car gets more immediate attention on the national level than a missing child, as the system now exists," she said. When a car is reported stolen in any state, its license plate number is entered into the FBI's computerized stolen car file, accessible immediately by any other state in the union.

Throughout their ordeals, the parents testified, they found a lack of communication among police agencies and private organizations established to find missing children.

The federal legislation would also eliminate waiting periods that many state police agencies and the FBI have before they may enter cases involving missing children.

The legislation, now in the form of three bills — two pending in the Senate and one in the House of Representatives — is expected to pass, since Hawkins has 66 cosponsors in the Senate, although Congress has adjourned until Jan. 25.

Besides Hawkins' Missing Children's Act, the bill was added as an amendment to the State Justice Appropriations Bill, also pending in the Senate, and a similar bill has been introduced into the House by Rep. Paul Simon (D-Ill).

Book Examines Small Systems

ROLLING MEADOWS, Ill. — A guidebook assessing the risks, responsibilities and requirements of small computer systems in a financial institution is available from the Bank Administration Institute.

Security, Audit and Control of Small Computer Systems is a 250-page publication written in a nontechnical style by L.J. Duff & Associates, Montreal.

It analyzes types of systems available, physical location within the organization and user/technician relationships.

Other topics include management control, authorization, documentation, application characteristics and security. The manual includes a glosssary of terms, a self-test and system inventory and application checklists.

The publication costs $25 for Institute members; $50 for nonmember banks. More information is available from Bank Administration Institute, 60 Gould Center, Rolling Meadows, Ill. 60008.

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DSS Forum Set for Boston

BOSTON — A one-day forum entitled "Evaluating Decision Support Software: A Managerial Perspective" will be held here on March 17 at the Suffolk University School of Management.

Designed to assist top-level managers to evaluate and select decision support systems (DSS) software, the seminar is being sponsored by the local chapters of six management and computer associations.

The conference will feature user presentations on eight DSS software products and a panel of DSS users.

Registration is $375 per person. Further information is available from DSS Conference, 215 First St., Cambridge, Mass. 02142.

Ancient System of Bartering Gets Modern Twist With Computerized Abacus

By Bruce Hoard
CW Staff

NEW YORK — Although bartering is an ancient form of trade, the goods exchanging hands here on New York's Upper East Side — furniture, airlines tickets and hotel rooms, for example — are far removed from the bazaars of Africa and the Middle East. In fact, bartering for goods and services has become so popular that some clubs and exchanges organized here for this trendy form of commerce are turning to computers.

Stimulated by today's high inflation rate, the barter idea has caught on so strongly that franchises are being spun off all over the country. What started as clubs have grown into full-blown businesses, frequently with more than 1,000 members, that depend on computers. Asked how hard it would be for Pfeister Barter to exist without its computer, Marvin Grafton, president of the 1,000-member strong exchange here, replied, "It would be impossible."

Pfeister uses an IBM System/34 and a full-time administrative staff of 15 to maintain information on debits, credits and offerings.

Debits and credits are the currency of bartering. If a furniture dealer wants to acquire hotel reservations, he puts in a request and the appropriate amount of debits are registered on his computerized account. He may choose to pay off said debits by providing a comparable amount of end tables and divans.

There is even an umbrella organization for barterers. The International Association of Trade Exchanges (Iate) has a membership of 115 out of the approximately 250 barter exchanges extant, according to Deputy Director Joe Weiss.

Of that 250, most of the larger, franchised organizations have computers, while the less affluent, nonfranchised, start-up clubs get by with manual systems in the beginning.

High Attrition Business

"It's a fairly high attrition business," Weiss said. "A lot of people who are caught up in this attrition don't seem to realize it's a very complex business. It's simply not trading marbles for Cracker Jacks; it's a regular minieconomy."

Some of the prerequisites for success include a sales force to ferret out clients, account and record keeping capabilities and a balanced clientele. Balance is especially important.

Any type of product that has an immediate ready cash market such as color televisions, automobiles and typewriters is tough to recruit for bartering. On the other hand, where there is slack demand and accumulated inventory, there is a likely barter member, Weiss declared.

Hotels and motels are prime examples. "A room that isn't filled is gone forever that night," he said.

Iate said the 250 extant organizations will conduct more than $350 million in business this year. It also warns against people who represent themselves as exchanges, but are in reality charging for inclusion in bartering directories.

In buying a computer for the 240-member Barter Advantage here, Executive Vice-President Jene Holtzman is confronted by a dilemma many other first-time buyers face: to buy a computer or farm out the work to a service bureau.

As he sees it, the service bureau approach brings with it the security of knowing someone else is responsible. However, the cost is high. If the Barter Advantage buys its own computer, it can save money and "grow with the system." The drawback is that maintenance becomes an in-house problem.

At this point, the problem is unresolved. Holtzman may go micro, he may go mini or he may go outside.

About one point, however, he is certain. "We're not going to pay cash for it if we can help it," he declared.

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Wolves in Consulting House Clothes?

NY Demand for DPers Seen Spawning Predators

By Bob Johnson
CW New York Bureau

NEW YORK — Competition for experienced data processing personnel is so hot in this city that some computer consulting houses are resorting to predatory practices, employee misrepresentation and even raiding from their own clients to produce qualified job candidates.

So warned those on the receiving end of such tactics — DP professionals and independent consultants working in the New York metropolitan area.

"Some of the consulting houses I have dealt with are good, but the number of people who are really good at what they do is small," according to Jim Barclay, director of computer services for Group Health, Inc. of New York and a 20-year veteran of DP.

"The good ones charge a lot of money as well and I don't think their talent is commensurate with what they are being paid."

Barclay said that some job candidates referred to him by consulting houses have walked through his door claiming they knew CICS and IMS when, in fact, they did not. "This was downright fraudulent," he said.

A DP manager at Banker's Trust Co. here said that most consulting houses provide technical help, but often claim they are different because they offer high-level expertise. "I tend to believe that this isn't true," he remarked.

Carolyn Rippy, an independent consultant and member of the executive committee of the New York/New Jersey chapter of the Independent Computer Consultants Association (ICCA), said that some houses that subcontract consultants are too often concerned only with making money, not with the welfare of their clients.

"Although these problems do not exist within all of the consulting houses, the fact of the matter is that they do exist and it can be damaging to the client," Rippy said. "There are good ones and there are some bad ones that I wouldn't touch," she added.

Bottom Line

Rippy acknowledged that everyone is in business to make money, but she added that some consulting houses are in business only to help what she called the "unprofessional" DPer — someone who is in a situation that he cannot handle and who is reaching out for help.

The unprofessional DPer is a prime target for the "predator" consulting house, which can "smell the blood of a wounded animal," she said. In order to land the contract, this kind of consulting house will offer the troubled DP manager anything he wants to get him out of a bind and to help him look good to upper management, Rippy warned.

"This can happen to anyone," she noted. "The problem is that managers, in time of need, react instead of act and they grab at any help that comes their way."

Managers caught in this kind of situation should not look for a consulting firm offering a quick solution, she advised. "Executives should look out for firms that promise everything or say they have an expert at their fingertips to take care of your problem. If the person is such an expert, why is he so available and why is he not out working?" she asked.

Managers should be on guard for blatant misrepresentation, Rippy counseled, recounting the story of a foreign consultant who was represented as being qualified to work with IMS and OS/Job Control Language when, in fact, he was from a DOS operating environment.

"He came in totally unprepared and for about three months the company paid for his training under the assumption that he was working on their project. This was in addition to a language problem and it posed a bad situation for the client, consultant and consulting house," Rippy recalled. "Fortunately he was bright, needed to succeed in the U.S. to remain here and caught up. Otherwise, he probably would have left the client high and dry."

A different sort of problem arises when a consulting house tries to convince a DP manager to hire one consultant until a more qualified one becomes available. Rippy said a consulting house may try to sell a manager on taking a substitute just so he can go back to management and tell them the problem is being worked on. "The house will assure the manager that as soon as the real expert is free he will come on the job and take care of things. This is risky," she said.

Who's to blame for these practices? Much of the blame appears to lie on the shoulders of the consulting firm's management and its inexperienced marketing personnel.

Barclay said that most of the marketers he deals with come from areas other than DP and it creates a problem. "For all I know the salesman selling me a high-level technician could have been selling Scotch tape for 3M last week," he said.

Rippy cites rapid growth within the industry and untrained salespeople as the major problems. "Salespeople usually work on a commission basis and are paid on how many bodies they place a week. When you have this type of situation, the main concern, again, is not the client, but the money," she said. In addition, Rippy noted that most house's salespeople are not trained in DP and are simply, "plucked off of the street."

Bad Feelings

But consulting house management is not solely to blame. According to Walter Proudy, project manager for management information systems (MIS) education and training at Northeast Utilities, many companies use consulting houses because they feel their staff employees are not as good as consultants. He said that this fosters bad feelings among internal employees and creates a perfect situation for the house to raid the best technicians of the lot for themselves, which they do.

Management should adopt some internal control to combat this "scalping" practice, Proudy said. "For example, a company might have a rule that if a programmer is hired away by a consulting firm he cannot work at his former company for at least two years."

He said that this will prevent a house from having a firm hold on any company and prevent raiding to some degree. He added that consulting firms are primarily concerned with their own needs and management better take notice.

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NEW YORK — The old troublesome question of who gets to use the computer — the company's DP people or its operating personnel — was settled here, apparently to everybody's satisfaction, by Avon Products, Inc., makers/distributors of cosmetics, toiletries and jewelry. The solution took the form of a decision support package that has put computing tools in the hands of the firm's marketing experts.

Nothing could make the professional DP people happier, according to Frank Giannantonio, Avon's director of information services. "I know the new system is working because the users now handle their own requests without asking for additional help from us," he said. "Give the end user the capability to access his data, but don't try to make him a data processing expert."

The problem, according to Giannantonio, was first to limit the number of users. "So many other people outside the marketing area wanted to use it too."

The system, formally known as Avon's Campaign Category Evaluation Statistical System (Access), has been in operation since June 1980. As a consolidated data base, it pulls together all of Avon's marketing support activities, enabling the company to compete better in an extremely dynamic market.

Access is an interactive analysis software system based on Express, a package developed and marketed by Management Decision Systems, Inc. of Waltham, Mass. Designed for non-DP types, Express offers analytic tools ranging from forecasting and model building to financial analyses and statistical methods.

Avon began the search several years ago for the necessary computer hardware and software to support its marketing operations, Giannantonio explained.

With a field sales force of 425,000 independent representatives in the U.S., the company receives an average of 44,000 orders a day. This translates into more than two million products made daily and the product mix is constantly changing. Avon introduces about 200 new products every year.

Main Tool

The main tool of this sales effort is a series of sales brochures, 26 a year, which Giannantonio estimates accounts for about 95% of Avon's sales. The company turns out approximately 15 million of these brochures every two weeks.

The timing and content of the brochures is the critical factor, he said, which is why Avon's merchandising support group had to replace manual processing with a powerful, comprehensive decision support system to keep up with customer demand and pricing trends. Manufacturing of products has to be closely coordinated to satisfy demand throughout each two-week campaign.

In the fall of 1978, Avon considered doing all the software development for the needed merchandising decision support system itself, but turned to Management Decision Systems' Express because of the need for sophisticated mathematical modeling and graphics, Giannantonio said.

"We just couldn't do it using standard programming languages and data base systems," he explained. "The task was enormous and truly not cost-effective." He added that "while the cost of developing the system would have been 'prohibitive,' the cost of maintenance would have been 'extremely large.' "

Giannantonio's staff's role was that of consultants and data base administrators, providing needed advice and training to the development team. The development team included both DP personnel and users. Management Decision Systems provided consultants to support both parties. Once the initial data bases were constructed and training of all personnel completed, the merchandising development team performed the majority of systems development on its own.

Access Link

Access, which runs on a Prime Computer, Inc. Prime 750, ties together two existing systems — each of them running on other hardware — into an integrated and compatible system, according to Giannantonio. The two systems include what is known as the "leader list," resident in a Digital Equipment Corp. PDP 11/70, and the "estimated vs. actual" (EVA) system that uses an IBM 4341 computer.

The leader list system is used by campaign planners to forecast the possible outcomes (sales and profit potential) of upcoming campaigns. The input to the leader list system comes from analyses done with Access and the judgment of experienced merchandisers.

EVA is an after-the-fact system. Field sales locations feed in information on how well the products actually sold. This data is teleprocessed into Avon's New York headquarters and batch-processed during nonoffice hours since there is no need for a truly real-time system.

These two kinds of data are merged to form the basis of Avon's data base. As a decision support system, Access/Express is being used to give the planning staff on-line access to the previous five years of historical, trend and planning information in both graphics and report formats.

Top management can have, on demand, summaries by business segment, category, sales classes and product status over time, Giannantonio said.

Without Access, Avon would have only the isolated computers doing relatively simple jobs independently of each other.

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Computers Identify Would-Be Suicide Victim

DES MOINES, Iowa — A team of investigators using computers and manual analysis techniques managed to identify a would-be suicide victim moments before the man turned himself in to an area psychologist.

Lester Williams, a 36-year-old unemployed father of two, received national attention when he sent an anonymous letter to the *Des Moines Register* stating he planned to commit suicide so his family would be eligible for welfare during 1982. Williams' letter brought a flood of job offers and donations.

Williams' letter appeared in the Dec. 30 edition of the *Des Moines Register* stating he would kill himself at 11:59 p.m. Dec. 31. Local officials were faced with identifying the anonymous author before he carried through with his threat.

Based on the handwritten letter, officials were able to determine that Williams was 36, a veteran, unemployed and a father of two. Using that information, investigators used computer records at the local unemployment office and the Polk County Commission on Veterans Affairs in efforts to identify 250 candidates.

But after identifying a list of area residents fitting the sketchy description outlined in the suicide letter, officials had to employ manual handwriting analysis techniques to narrow down the field.

"We were on the right track, but we just couldn't pin him down," said Jerry Knapp, a job counselor at the Des Moines Vets Center, a job placement arm of the Veterans Hospital. "We had him pegged in the same hour he turned himself in. We knew who he was before he turned himself in."

To perform the search, DPers had to create a special program to check computer records stored at the Veterans Administration's regional office in St. Paul, Minn. Knapp said records are normally stored according to illness or disability, not age or number of children. It took about two hours to create the special program.

"We had every agency in town [checking computer records]," Knapp said. He added that investigators manually checked printouts from other agencies in efforts to narrow down the field of likely candidates.

After repeated pleas by the news media not to kill himself, Williams turned himself in to a local psychologist early Dec 31. Williams has reportedly been offered, and plans to accept, a job with a local department store.

DPer Charged With Forgery

NEW YORK — Charles Fowler, a computer operator at the New York City Human Resources Department (HRA), has been charged with forging the signatures of intended recipients of Authorizations to Participate (ATP) food stamp forms, which were stolen from HRA computer room stock.

The unauthorized computer printing of duplicate ATPs in the HRA computer unit where Fowler, a 41-year-old Bronx resident, worked was uncovered in a joint investigative effort undertaken by the Department of Investigation's (DOI) Computer Security Services Unit and the HRA. According to Rolf Moulton, director of the Computer Security Services Unit, security controls within the HRA detected that blank stock was stolen and that fraudulent ATPs had been cashed. The bogus ATPs were recovered and the handwriting of the signatures of the "clients" compared to examples provided by Fowler, the DOI said.

When asked if there was any tampering with the HRA's twin IBM 370/158 CPUs, Moulton replied that he could not conclusively comment on the mechanics of the crime.

The charges against Fowler include forgery in the second degree and criminal posession of forged instruments, both class D felonies punishable by up to seven years imprisonment, and criminal possession of stolen property in the second degree, a class E felony, punishable by up to four years imprisonment.

Fowler's arrest comes at a time when New York City authorities are making an effort to curb the criminal abuse of food stamp ATPs. A pilot program requiring recipients to have an encoded photo ID card began here in November [CW, Nov. 16, 1981] in conjunction with a Department of Social Services electronic payment file transfer system.

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Altos Shows Performance Gap Between Disks

By Hillel Segal
Special to CW‡

Two systems by Altos Computers, Inc. showed strength in numerical processing for scientific application, as well as a wide gap in disk performance between floppy and hard disk models.

The ACS8000-15, a floppy-based system, was otherwise identical to its hard-disk counterpart, the ACS8000-6. The latter system showed considerably better performance in the accounts receivable application, which includes a good deal of disk storage and retrieval.

Based on the popular Intel Corp. Z80 microprocessor, Altos has created a product line with a great deal of flexibility in its configuration. Starting with dual floppy disks in the ACS8000-15, the user can add hard-disk drives in increments of either 10M, 14.5M or 29M bytes. The ACS8000-6 includes the 14.5M-byte drive. An extra pair of floppies or a 13M-byte tape drive can also be added.

Both of these Altos systems were tested in our continuation of Series 1 and 2, and the results are included together in a single benchmark report. The benchmark tests, sponsored by the Association of Computer Users (ACU), now include about 48 different computers in three different price ranges up to $50,000. In this series, the systems tested are all less than $25,000 in price.

The computers are tested for single-user performance in a variety of tasks. Reported here are the scientific/engineering test, a math-oriented exercise which does not include any disk operations, and the accounts receivable test, which uses a combination of storage and processing operations in an accounting simulation.

System Lineup

The Altos ACS8000-15 included the processor, 208K bytes of main memory, a pair of double-density floppy disks (1M byte total), and seven I/O ports — one parallel and six serial.

Altos does not make its own display stations or printers, so our test team used a Texas Instruments, Inc. 810 printer and a Hazeltine Corp. 1420 CRT terminal. Including the cost of these components, the system price was $9,875.

We also had an opportunity to test the hard-disk capabilities of the equipment. The addition of a 14.5M-byte drive to the system brings the total price to $14,375 and changes the designation to ACS8000-6. (The ACS8000-10, using a 10M-byte Winchester-type hard disk, was tested as a multiuser system in the Series 3 benchmark tests.)

The prices just quoted include software, which is listed and sold separately. The CP/M operating system and Basic-80 language added a total of $895 to the cost.

The ACS8000-15 gave a strong performance in the scientific/engineering test, showing off its processor's math capabilities with a finish in five minutes, 39.3 seconds. Total time, including the compilation step, was 7:54.5. The accounts receivable test runtime was 3:52.7, while the total time was 10:41.5.

The ACS8000-6, the same system equipped with hard disk, gave an improved time for the accounts receivable test, finishing in 1:35.1. It is to be expected that a hard disk will improve performance on this test, which uses much disk access.

The Altos approach of supplying systems without a specific terminal or printer allows a great deal of flexibility in putting together a complete package, but places a greater responsibility on the dealer and, ultimately, the end user. Compatibility of equipment and software, availability of maintenance service and similar considerations would apply.

Benefits of Standardization

Incorporating the popular Z80 microprocessor allows Altos to offer the CP/M and MP/M operating systems (originated by Digital Research, Inc.) and the Oasis operating system (by Phase One Systems, Inc.). For single-user systems, CP/M is often preferred because of the extent of software available for it. In multiuser configurations, Oasis is generally chosen.

Languages available for the system include Basic-80, Fortran-80 and Cobol-80 (all by Microsoft, Inc.), Pascal (Sorcim), APL (Vanguard Systems, Inc.) and others. Altos publishes a 50-page guide to operating systems, languages and applications software that can be used on ACS8000 systems.

The Basic-80 language includes extras such as the WHILE ... WEND structure, automatic line numbering and renumbering, and assembly language subroutine calls. Direct execution of Basic statements is also provided.

One criticism noted by the test team is the lack of syntax error checking immediately after the line is entered; like many versions of Basic, this one requires the user to run the program to learn of any syntax errors.

On the other side, the testers noted with favor the combination of interpretive and compiled capabilities in Basic-80. Using the interpeter during programming and debugging offers greater convenience. Once fully debugged, a switch to compiled operation gives greater speed of execution, and the somewhat time-consuming process of compiling and linking the program need only be done once.

Altos does not offer applications software for business functions such as accounting, leaving the addition of such software to the dealers. There are quite a number of business packages available for the CP/M operating system, and dealers combine these with the Altos hardware and peripherals of their choice to create a turnkey system.

Documentation supplied with the system included the CP/M manual, a Basic-80 language manual, the Altos ACS8000 user's manual and documentation covering various software utilities and the hardware. All are suitable for the experienced programmer. Novices need a more general training manual; as one user commented, "I wish there was a good manual for those of us who do not understand 'computerese.' Then we would not be so dependent on the dealer." Of course, the dealer would also add to the package whatever documentation was supplied with the applications software.

In our user survey, 10 users of ACS8000 systems were contacted, using names supplied by the manufacturer. In most cases, they had purchased a complete system including all software and were not doing any programming themselves. Most were using the system for accounting functions, while some were also using it for word processing.

Hardware configurations in use varied, with about half of the systems incorporating a hard disk. One user had the asynchronous communications package and was communicating to a time-shared computer. Another had the cartridge tape backup system and was pleased with its functionality.

Most of the users felt the hardware was exceptionally reliable and reported good service. Software support by the dealers also received good reviews. Users who listed their reasons for buying the system mentioned price, flexibility, the hard disk options and multiuser capability, along with availability of languages other than Basic. Another frequently mentioned reason was the general-purpose nature of the system: both word processing and accounting could be performed.

Hillel Segal is president of the Association of Computer Users, a nonprofit association with members in the U.S., Canada and several other foreign countries. A package of information about the Association of Computer Users is available from the group at P.O. Box 9003, Boulder, Colo. 80301.

SCOREBOX

System: Altos ACS8000-15
Current Price: $9,875

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	C-1 Scientific Engineering Time (min.)	C-3 Accounts Receivable Time (min.)
Pertec PCC 2000	28:48.4	6:04.3
North Star Horizon	12:01.9	1:57.7
Cromemco System Two	14:52.6	2:48.0
Texas Instruments 771	22:05.4	3:38.1
Vector Graphic System B	19:30.0	5:56.5
Decstation 78	7:55.7	4:21.5
Radio Shack TRS-80 Model II	20:00.7	3:38.6
Apple II+	21:11.0	6:17.4
Digital Microsystems DSC-2	13:24.9	3:28.8
Ohio Scientific C3-A	12:10.7	15:49.3
Alpha Micro AM-1011	5:18.3	3:25.3
Data General CS/10 Model C1	58:21.0	*
SD Systems SD-200	17:42.8	6:16.4
Wang 2200SVP	2:13.3	2:23.0
Altos ACS8000-15	5:39.3	3:52.7**
NEC Astra 205		
Dynabyte 5300		
Billings BC-12 DFM		
Commodore CBM-8032	to be covered	
Smoke Signal Chieftain	in future issues	
Vector Graphic 3005		
Xerox 820		
IBM 5120		
IBM Personal Computer		

* Tested with hard-surface disk rather than floppy. C-3 time was 2:40.3.
** The hard disk time for this test was 1:35.1. All times for this system are runtime only.

This is the 44th in a series of articles giving the highlights of benchmark tests conducted on popular small computer systems. The full reports were originally published by the Association of Computer Users, a 4,000-member nonprofit organization.

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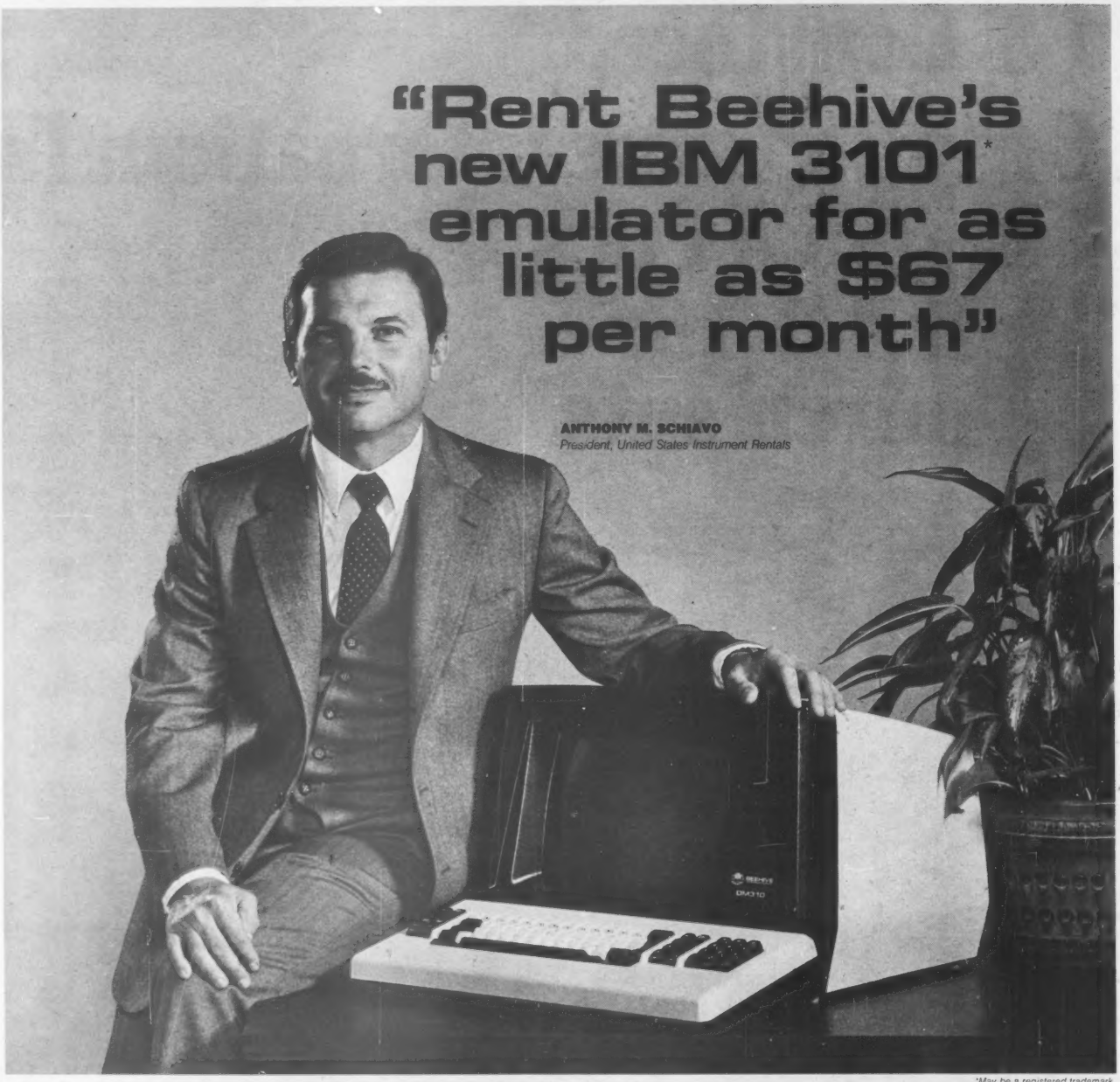

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Human, Tech Concerns Linked as OA Factors

By Bruce Hoard
CW Staff

FRAMINGHAM, Mass. — Both human and technical factors must be considered when implementing office automation (OA), according to a recent report from the Continuous Information Services branch of International Data Corp. (IDC).

Entitled *Issues in Implementing Office Automation*, the report maintains that the boundary between human and technical concerns is unclear, noting that rarely is a single issue totally human or technical in nature.

The report compares the incipient stages of OA with those of industrial automation, DP and telecommunications. "Since the early days of data processing, people have realized that distinctions between human and technical issues are not always easy to draw," the report said. For instance, choosing a menu-driven word processing system over a code-driven one is a technical decision, but it has important effects on the way people will use the system and the kind of training they will require.

The respective rates of change for technology and organizations are not the same, the report noted. In dealing with OA, significant organizational change may come rapidly if a new manager with different ideas about word processing decides to implement his ideas.

In order to deal with change, offices should not become too rigid in technology or organization, IDC said.

OA has the potential to displace workers in the fashion of industrial automation. People's thinking on OA is still colored by the industrial experience and, the report noted, the effects of OA are "far from universally positive" in the minds of workers.

However, the growth of industrial automation was marked by the parallel proliferation of unions, an event that has yet to become common in offices.

OA-DP Analogy Appropriate

An OA-DP analogy is apt because both have had to deal with rapid technological advances, the IDC report noted. Both disciplines have also brought with them the integration of a changing technology into traditional business environments.

Contrarily, DP has "historically flourished in centralized departments," while OA is "largely a creature of decentralization."

The telecommunications industry has had to deal with establishing a standard, worldwide set of protocols; so must OA. On the other hand, because it has been a "hybrid creature" of government and industry, telecommunications has drawn national governments into the battle over standards; no such pressure exists concerning OA.

A recent IDC survey of manufacturing firms revealed that 88% of the companies polled expected OA standardization to be a problem within the next three years.

The survey of manufacturing firms also found that over half of the individuals with full- or part-time OA responsibility have backgrounds in systems or DP. Beyond that, the survey results indicated, "more often than not, the organizational responsibility for office automation lies within a DP or [management information systems] MIS department."

The report calls pilot projects in OA "an attractive concept," but qualifies that endorsement with several caveats: They can be expensive, results can be ambiguous and pilot project managers are usually biased in their evaluations.

The 79-page report costs $2,000 from IDC, 5 Speen St., Framingham, Mass. 01701.

Report Lists Top OA Vendors

FRAMINGHAM, Mass. — Seventeen leading office automation (OA) vendors are scrutinized in the International Data Corp. (IDC) study *Major Vendors in Office Automation.*

According to IDC's Continuous Information Services branch, five of the 17 either offer or have announced integrated office systems involving a wide range of technologies and applications. The five are IBM, Xerox Corp., Wang Laboratories, Inc., Burroughs Corp. and Datapoint Corp.

Of the remaining 12 vendors, the report lumps together Digital Equipment Corp.; Four Phase Computer Systems, Inc.; Honeywell, Inc.; Hewlett-Packard Co.; MAI/Basic Four Corp.; and Prime Computer, Inc. as vendors of minicomputers or distributed resource systems with the capability of providing a wide range of office technologies.

A third group — CPT Corp., Exxon Enterprises, Lanier Business Products, Inc. and Phillips/Micom — is associated with word processing and movement toward office integration.

Lastly, Harris Corp. and Northern Telecom Systems Corp. are grouped together as communications-oriented companies with a strong office orientation.

Financial and product information from many of the vendors is described in the 163-page report, which sells for $2,000 from IDC, 5 Speen St., Framingham, Mass. 01701.

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Dispatch System Halves Police Response Time

LONG BEACH, Calif. — The Long Beach Police Department has experienced a 50% faster response time from the moment an emergency call is received to the time a police unit is dispatched, thanks to a computerized dispatch system.

Installed in October 1980, the Digital Equipment Corp. PDP-11/70-based dispatch system serves an area of 55 square miles that includes 365,000 residents.

Besides its dispatching functions, the system assists with management of police units in the field and provides the department with a means by which management data is captured for report generation, according to Thomas J. Wood, communications manager.

The system's software was developed by Public Management Services, Inc., a Planning Research Corp. company. The man/machine interfaces for the system are 30 Model ADM 42 video display terminals from Lear Siegler, Inc.

"In addition to saving time, the system also saves the department money through better allocation of resources," Wood said. "By knowing the status of all police units, we can more accurately station our forces where they are needed."

The Long Beach Police Department receives approximately 1,100 calls in a 24-hour period for a total of more than 400,000 calls per year. Of this number, the department dispatches a police unit for about 70%, and the remainder of calls are handled through referral or transferred to the appropriate department.

When a call is received, the dispatcher types into a terminal the address, name of the calling party, problem and code identifying the problem. The computer verifies the address as being located in Long Beach and checks for duplicate calls in that part of town.

"The computer then checks the local history of the site," Wood explained, "and tells the dispatcher, for example, if this is a hazardous area or if invalids or children live there." The system then looks at the available police units in the area and tells the dispatcher the name of the nearest police unit, which is then notified and sent to answer the call. "This results in a high level of efficiency," Wood said, adding, "Completion of the entire process takes only seconds."

Better Service

The system also provides management with a data base to facilitate better service to the public, according to Wood. "All information received by the dispatch system is captured for future management use," he said. "The data is retained indefinitely, allowing reports to be generated from this information at any time."

For example, he explained, police personnel can use the system to analyze routing data by requesting such information as the activities of "xyz" police unit four days ago or the number of "x"-type calls received the previous day. "In our opinion, this system is essential to the effective operation of our city's emergency services," Wood concluded.

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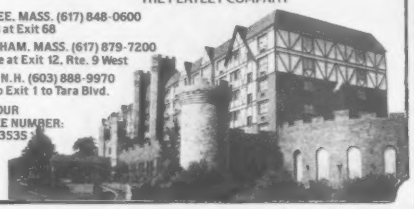

Software Seminar Slated For February on West Coast

LOS ANGELES — The Education Foundation of the Data Processing Management Association (DPMA) will sponsor a seminar on "Software Requirements Analysis and Design" at three locations on the West Coast in February.

The seminars will be conducted in Palo Alto, Calif., on Feb. 8-9; at Costa Mesa, Calif., on Feb. 11-12; and in Los Angeles on Feb. 25-26.

The program is scheduled to feature Dr. Richard H. Thayer, professor of computer science at California State University, who will discuss the use and results of advanced requirements analysis and design techniques.

The registration fee is $445/registrant. For DPMA members, the fee is $425. More information is available from Department SRD, P.O. Box 91295, Los Angeles, Calif. 90045.

Exposition Set For April; Minis, Micros Featured

DALLAS — The second annual Southwest Computer Show & Office Equipment Exposition, sponsored by National Computer Shows, will be held here April 15-18.

This show features microcomputers and minicomputers for business, education, government, industry and personal use. Data and word processing equipment will be showcased, as will new office machines, computer peripherals and office supplies. Admission to the exposition will be $5 for adults and $3 for children under 10. Further details can be obtained from show sponsors at 824 Boylston St., Chestnut Hill, Mass. 02167.

Lehigh Receives CAD/CAM Grant

BETHLEHEM, Pa. — Lehigh University has received a $100,000 grant from the Westinghouse Educational Foundation in support of a computer-aided design and manufacturing (CAD/CAM) program.

The program will address the problems of integrating the related engineering functions of design and manufacturing.

The grant will be given over a three-year period, according to George E. Moore, executive director of the foundation, and Lehigh President Dr. Deming Lewis. More than 25 firms now support the university's program, according to a spokesman.

WPI to Offer DP Seminars

WORCESTER, Mass. — Worcester Polytechnic Institute (WPI) is offering a series of one- to seven-day seminars until June on topics in DP.

Some of the topics to be covered include "Project Management," "The Engineer as Manager," "Creative Problem Solving," "Improving Shop Floor Production Control" and "Improving Your Negotiating Skills."

The registration fees range from $295 for one day to $990 for a week, WPI said from Worcester, Mass. 01609.

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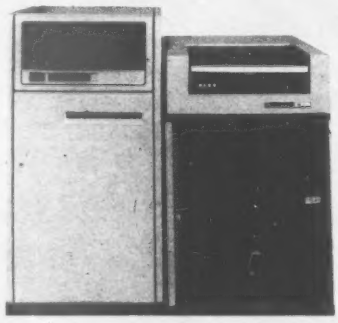

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Consultant Examines Data Base Milestones

By Bob Johnson
CW New York Bureau

NEW YORK — "Data base administrators must remember that data bases are created for users and not vice versa."

That is what Shaku Atre, an independent consultant and author of *Data Base: Structured Techniques for Design, Performance and Management*, told members of the Association for Women in Computing (AWC) at a meeting held here recently.

Speaking on data base management and how it affects the DP environment, Atre first offered a brief historical outline of data base evolution.

She divided what she called the milestones in data base development into time spans. The "Stone Age" was the years before 1962, Atre said; the "Middle Ages" were from 1962 to 1969; the "Renaissance," from 1969 to 1972; and the "Past," from 1972 to the present.

In the "Stone Age," Atre said, DPers succeeded in confusing the user community with terminology, a bad start which continued throughout data base history. "Data records or files could only be accessed by using input/output routines written by programmers. This was a very time-consuming task that hindered the flow of data to the user," Atre said.

"Finally," she continued, "someone thought that a common pool of access methods, centrally located, which would make data more easily accessible should be created." The result was that access methods such as Qsam and Isam were born, Atre said.

With these access methods established, Atre's "Middle Ages" came about. However, something more was needed that would allow users to "view" data that they specifically needed. She explained that sometimes data appears differently, depending on how it is accessed. A need for a "magic box" that enabled viewing of specific data spawned the data base management system (DBMS).

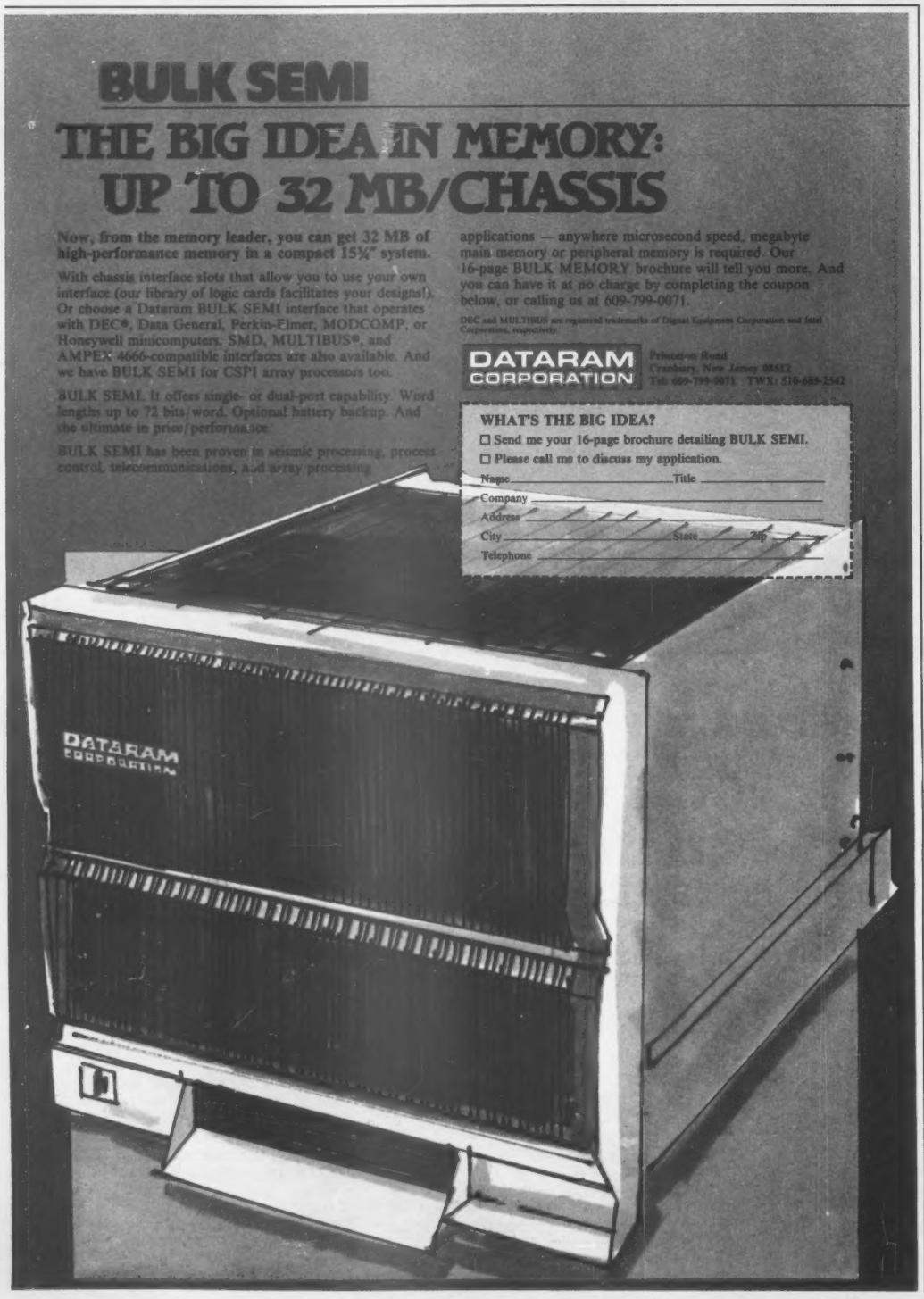
The coming of Atre's "Renaissance," around 1969, brought with it two such DBMS, according to the speaker. "IBM's IMS and Honeywell, Inc.'s Integrated Data Store (IDS) DBMS attempted to make user's lives a little easier and they succeeded for a few years," she said. However, she noted that users were forced to remember a lot of details about their particular data bases and that DP departments compounded the problem by acting as though data bases belonged to them. Atre said that users were still confused about how to get data and that DP departments made matters worse by creating one of the biggest empires in DP — Job Control Language (JCL).

Direct Access

The advent of the minicomputer changed some things by allowing users to access data directly without going through the DP department. This brought the DP world into Atre's "Past." But the speed of technology is changing DBMS history again. Data base administrators must now adapt to another method of offering information, Atre said.

The key to effective data base operation is now data independence, she continued. Users do not care about where data resides or how it is formatted, she claimed, "They just want to get at it." She added that anything data base administrators do to manipulate data is OK, as long as the user's applications are not affected. True data independence means being able to move data where it suits the administrator best and then getting it to the user.

Acquiring the right DBMS is the primary goal of the data base administrator. But getting a system that is 100% data independent is almost impossible because of performance requirements, Atre noted. The user's "conceptual requirements" should be the main consideration, she said. A logical model can be developed from these requirements to serve as a basis for DBMS selection. Atre noted, however, that compromises are usually necessary because of various DBMS idiosyncracies.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Precompilers Aid Firm's Systems Development

SPRING CITY, Pa. — Cobol precompilers can work, based on the experience of Jones Motor Co. here, which is using two Cobol preprocessors to "produce systems on time and within budget."

Richard A. Jokiel, the firm's manager of systems development, said his company chose Scobol, a precompiler from Software Consulting Services, Inc., to extend Cobol for structured programming and Cullinane Database Systems, Inc.'s IDMS preprocessor to expand data base statements into data declarations and calls to the IDMS data management routines.

The combination of the structured control blocks of Scobol and the data base management system (DBMS) statements of IDMS make Cobol a more expressive and, therefore, more effective programming tool, according to Jokiel.

When used with data base packages, precompilers like the one supplied with IDMS simplify the complex DBMS interface, he said, and this reduces programming confusion and coding errors.

"Our problem was to integrate the actions of both of the preprocessors we are using so that extended Cobol [that is, Scobol plus IDMS Cobol] appears to be the language supported by the resident Cobol compiler," Jokiel said.

The danger of precompilers occurs when they do not adequately support the extended language, he noted. A similar situation would occur if the Cobol programmer were forced to debug systems with the Assembly language expansion of the Cobol code. "For a preprocessor system to work, the programmer must be able to debug at the extended language level," he said.

To build an extended Cobol environment requires careful engineering. "What we were able to do at Jones should be applicable to many DP shops where extending Cobol's functionality is important," Jokiel said.

Jones Motor Co.'s IBM 370/148 runs VS1 and VM — VS1 supports its batch processing and teleprocessing network; under VM, CMS is used for program development.

When a regular Cobol program is compiled, the compiler generates a program listing followed by compiler error messages; an identifier cross-reference listing; and data and procedure maps. Runtime errors reference the locations specified in the procedure and data maps.

Several Steps

The precompilers interpose several steps between what the programmer writes and what the compiler reads. "The trick is to produce a listing that looks like a compile listing with appropriate maps of the extended language.

There are tools in the Scobol package which make this straightforward, no matter how many precompilation steps are used," according to Jokiel.

He noted that the tool for making all of this work together is Cobxref, a cross-reference program which comes with the Scobol precompiler.

Each precompilation step augments the source code with additional Cobol statements, he said. All error messages relate the expanded code back to the original source while preserving the line numbering of the expanded code. "It also produces a program listing, which is superior to that produced by the compiler," Jokiel said.

Jones has had Scobol in production for nearly nine months and has just completed the first major application with it.

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A. You shouldn't sign for a 370-based backup system when you already have the 3081 in your plans. The 165 is unsupported now. What IBM version of the SP will leave the 168 behind? At SUNGARD we have current IBM hardware installed and a firm commitment to the 3081. We replaced our 168 in 1979. And we're committed to remaining current, not only with processors, but also with peripherals.

Q. Is the facility itself suitable and secure?

A. Each of the three SUNGARD Recovery Centers has an average of more than 30,000 square feet dedicated to supporting the recovery needs of SUNGARD subscribers. This includes, in addition to the backup configuration, a ready-conditioned space in each center with sufficient cooling and power for a replacement 3033 and associated peripherals. Four thousand square feet of office and terminal space is equipped with power and telephone jacks for your recovery team. And the entire facility is secured with a controlled access system and fire detection and protection systems you should expect in a first class center.

Sungard™ Centers have the answers.

Q. Who are the other subscribers, and are they satisfied with their Recovery Center?

A. As a SUNGARD subscriber you will have the right to know who the other users of your backup center are. As a SUNGARD prospect we'll share with you the names of Fortune 500 Industrials and Fortune 200 Financial institutions which have agreed to let us refer you to them to help you evaluate SUNGARD. You'll recognize the names and appreciate their serious commitment to providing the best available Recovery Centers for their installations. Our subscribers can report to their management with confidence that they have a tested recovery capability that works.

Q. What is the true cost of having a Recovery Center to go to in the event of a computer disaster?

A. We're the high-priced spread, but you get much more with SUNGARD. Our standard offering includes everything you need, so your cost with SUNGARD is very visible. Hidden costs to make other centers usable, especially network backup, can drive their price past ours.

We think that a workable disaster recovery solution is part of the cost of doing business in today's computer-dependent world. When compared with other accepted costs of doing business, your monthly recovery fee at SUNGARD is:

- Less than the cost of a security guard around the clock.
- About half of what you pay for monthly maintenance on your processor.
- Less than one string of disk drives or bank of tape drives.
- The equivalent of about $1.50 per square foot per year, including equipment, test shifts and technical support.

Q. Are there other costs?

A. Not for the SUNGARD Recovery Center. There is obviously cost associated with developing and maintaining your recovery capability. Our contingency services organization can bring its experienced staff to your site, to assist you in the development of that capability at your option. But the cost of having a second site at SUNGARD, including ample test shifts and extensive network backup equipment, is all in our basic fee.

Q. Can I test remotely?

A. Yes, you can. Our plan includes the ability to run your backup system without sending your recovery team to the SUNGARD Center. We still suggest that you come to the Center once a year to test, in order to remain familiar with your second center.

With remote testing and the opening of our third SUNGARD Center in Chicago in December, and our West Coast and Southwest Centers planned for 1982 and 1983, distance should not be a significant factor. And this network of SUNGARD Centers offers you added protection in the event that your primary SUNGARD Center is occupied by another subscriber experiencing a disaster.

At SUNGARD, we are committed to providing a quality nationwide service. Recovery services is SUNGARD's only business. We originated the concept and assembled an organization of talented, experienced professionals to support your needs. Nobody can touch SUNGARD's experience, commitment and capability in providing disaster recovery services.

For more information, call 800-523-4970. In Pennsylvania, call collect to 215-972-4776. Or return the coupon.

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Call for Papers

PRODUCTIVITY 82 — ACM/CIPS, Seattle, June 23-26.

This event is being cosponsored by the Association for Computing Machinery and the Canadian Information Processing Society. Papers are being sought on productivity with regard to industry, human resource management and computing. They should focus on practical experience and be directed at a nonspecialist audience.

Prospective authors are asked to submit their notice of intent as soon as possible. Rough drafts are due Feb. 1. Drafts should include five copies of the paper and a separate 200-300 word abstract.

Notification of acceptance will occur on April 15. Inquiries should be directed to Productivity 82, 10636 Main St., No. 276, Bellevue, Wash. 98004.

FIRST INTERNATIONAL SYMPOSIUM ON AUTOMATED INTEGRATED MANUFACTURING, San Diego, April 5-6, 1983.

The American Society for Testing and Materials, a nonprofit organization that develops voluntary consensus standards in materials, products, systems and services, is sponsoring this conference.

Appropriate topics for contributions include: control systems found in a hierarchical structure of computers used in manufacturing; various computer networks within such a structure; protocol and language structure for communications within such networks; interfacing between different networks within the factory structure; language translators and protocols; and related topics.

Titles are due by Feb. 15. Three copies of a 300-500 word abstract should be sent by April 1 to Dr. Leonard B. Gardner, P.E., 2406 Buttetop Place, Spring Valley, Calif. 92078. Authors will be notified of acceptance by July 1.

SECOND SYMPOSIUM ON RELIABILITY IN DISTRIBUTED SOFTWARE AND DATABASE SYSTEMS, Pittsburgh, Pa., July 20-21.

Sponsored by the Institute of Electrical and Electronics Engineers Computer Society in cooperation with the Association for Computing Machinery and the University of Pittsburgh, this symposium will focus on the continuity of operations in real-time processing systems.

Topics of interest include: data base integrity and consistency in distributed systems; robust concurrency control; fault-tolerant distributed data base and software systems; communications primitives (languages) for reliable multiprocessing systems; software and data structures for error confinement and bypass, graceful degradation and system reconfiguration, recovery and restart; and techniques for nonstop operations in applications such as air traffic control, airborne systems, nuclear plant software, defense and medicine.

Five copies of contributions are due by Feb. 15 to Prof. Gio Wiederhold, Computer Science Department, Stanford University, Stanford, Calif. 94205.

ASSOCIATION FOR COMPUTING MACHINERY'S 1982 ANNUAL CONFERENCE, Dallas, Oct. 25-27.

Tutorials, proposals for panel discussions and short technical papers or surveys are being solicited for this event.

Suggested topics are: operating, data base or distributed systems; programming languages; artificial intelligence; business data processing; software engineering; personal computing; office automation; computer networks; privacy and security; computer architecture; computer graphics; computers and the handicapped; computer law; computer-aided manufacturing/computer-aided design; computers and society; simulation; and applications (medical, education, energy, military, aerospace and entertainment).

Authors of papers should submit four copies of their work (not to exceed 12 double-spaced, typed pages) by Feb. 27 to ACM '82, Call for Papers, Spring Valley Station, P.O. Box 402501, Dallas, Texas 75240. Notifications will be issued by April 30.

EIGHTH INTERNATIONAL CONFERENCE ON VERY LARGE DATA BASES, Mexico City, Mexico, Sept. 8-10.

Technical papers on all aspects of data base technology are being sought for presentation at this conference. Suggested topics include: data base system design and evolution; distributed data bases; data base system interfaces; data base control; data base system implementation; structures for unconventional data bases; and applications.

Five copies of papers, not to exceed 5,000 words in length, along with a 100-word abstract, are due by March 8 to Prof. Dennis McLeod, Computer Science Department, University of Southern California, SAL-200, Los Angeles, Calif. 90007. Authors will be notified of acceptance by May 3.

ACM Publishes Report On Recommended Curricula

NEW YORK — The *ACM Recommended Curricula for Computer Science and Information Processing Programs in Colleges and Universities, 1968-1981* has recently been made available by the Association for Computing Machinery.

The 192-page volume consists of eight curriculum reports prepared by various ACM committees over the past 13 years. The anthology is intended to aid educational institutions, students and planners involved in the development of programs for higher computer education.

The individual curriculum reports provide suggested texts and references, representative career paths and specialization tracks.

The following reports make up the text: "Recommendations for a Two-Year Associate Degree in Computer Programming," "Education Programs in Information Systems," "Recommendations for Master's Level Programs in Computer Science," "Curriculum '78: Recommendations for the Undergraduate Program in Computer Science," "Curriculum Recommendations for Undergraduate Programs in Information Systems," "A Computer Science Course Program for Small Colleges," "Curriculum Recommendations for Graduate Professional Programs in Information Systems" and "Curriculum '68: Recommendations for the Undergraduate Program in Computer Science."

The text may be purchased for $15 from ACM at P.O. Box 64145, Baltimore, Md. 21264.

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OAK BROOK, Ill. — Two computer-based self-instruction courses that teach entry-level trainees to operate IBM 3276 or 3278 terminals are available from Deltak, Inc.

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Series No. 7-6XX-CE is available for purchase or rent. Purchase price is $3,000; rental is $50 to $125/mo, depending upon the size of the contract.

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SCHEDULED FOR MAY 1, 1982

The annual examination for the Certificate in Data Processing (CDP) will be held on May 1, 1982, at selected test centers throughout the world.

Specific requirements for this year's examination are detailed in the "Certificate in Data Processing Examination Announcement and Study Guide." The study guide and application form for the 1982 examination are available on request from ICCP.

Deadline for Filing Application is March 1, 1982

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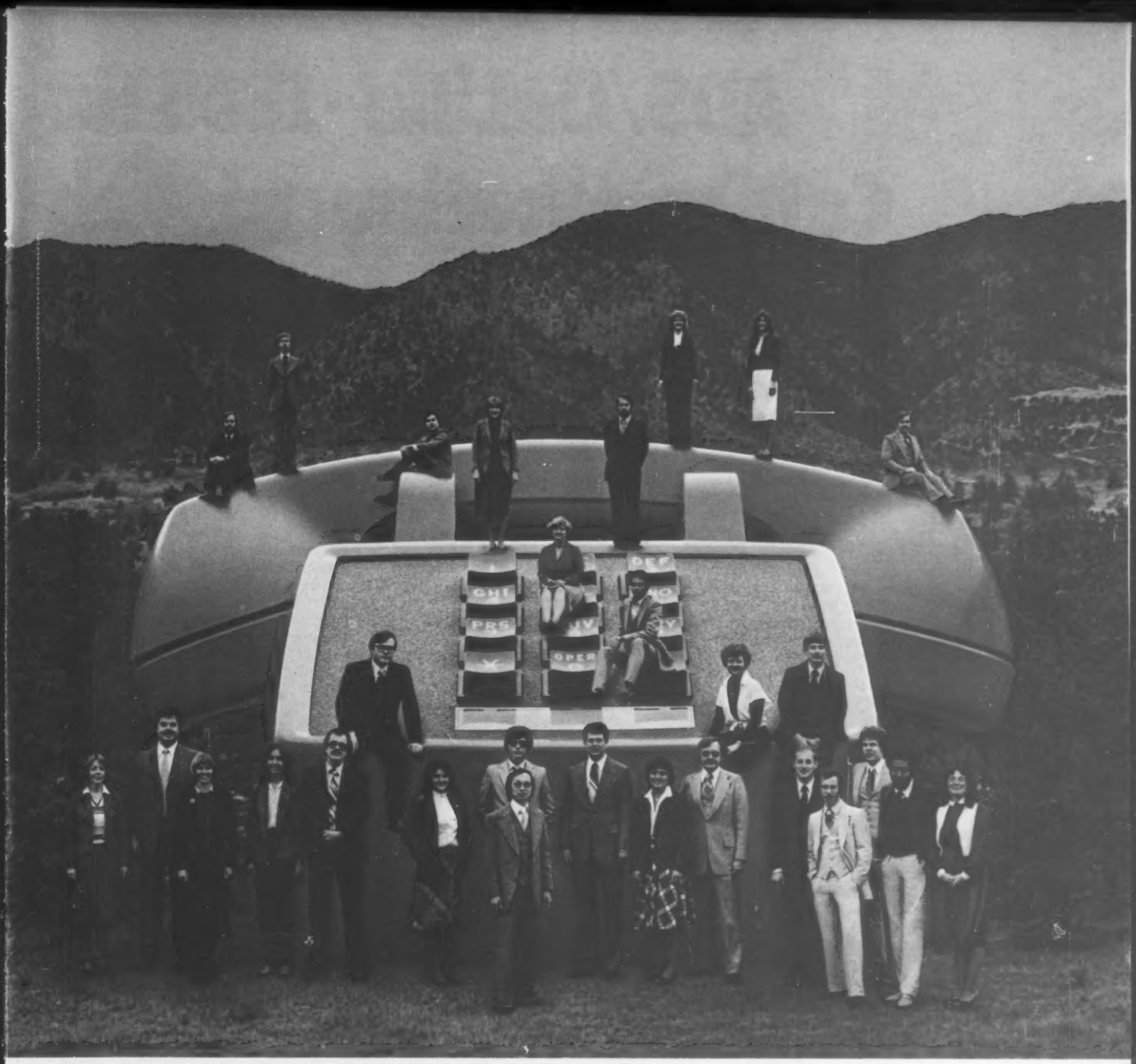

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Calendar

Feb. 1-2, Los Angeles — **Structured Testing.** Contact: The American Institute for Professional Education, Carnegie Building, 100 Kings Road, Madison, N.J. 07940. Also being held Feb. 4-5 in Boston.

Feb. 1-2, Detroit — **Software: A Legal Briefing for EDP Professionals.** Contact: The American Institute for Professional Education, Carnegie Building, 100 Kings Road, Madison, N.J. 07940. Also being held Feb. 8-9 in Boston.

Feb. 1-2, Washington, D.C. — **Information Management/Data Processing Seminar.** Contact: Tom Rabe, U.S. Independent Telephone Association, Suite 1201, 1801 K St., Washington, D.C. 20006.

Feb. 1-2, New York — **Computers in Food Service Management.** Contact: Sylvia Nogelman, Seminar Manager, Center for Retailing Management, 425 Park Ave., New York, N.Y. 10022.

Feb. 1-2, Houston — **CICS/VS Performance & Tuning.** Contact: On-Line Software International, 65 Rt. 4 E., River Edge, N.J. 07661.

Feb. 1-2, Denver — **Data Base Concepts for Auditors.** Contact: Stephanie Gaubatz, Program Manager, RHY Consultants, 1444 Balsam St., St. Paul, Minn. 55122.

Feb. 1-2, San Francisco — **Digital PABX.** Contact: The American Institute for Professional Education, Carnegie Building, 100 King Road, Madison, N.J. 07940.

Feb. 1-3, San Francisco — **Federal ADP Procurement Workshop.** Contact: National Institute for Management Research, P.O. Box 3727, Santa Monica, Calif. 90403.

Feb. 1-3, New York — **Data Communications: An Introduction to Concepts and Systems.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Feb. 1-3, New York — **MVS Systems Management Workshop.** Contact: Sondra Schwartz, Boole & Babbage Educational Services Division, 510 Oakmead Pkwy., Sunnyvale, Calif. 94086.

Feb. 1-3, Orlando, Fla. — **Florida Instructional Computing Conference.** Contact: Florida Association for Educational Data Systems, P.O. Box 10587, Tallahassee, Fla. 32302.

Feb. 1-3, New York — **Structured Design Workshop.** Contact: Yourdon, Inc., Ave. of the Americas, New York, N.Y. 10036.

Feb.1-5, Ann Arbor, Mich. — **The Programmed Learning Workshop.** Contact: The University of Michigan, Division of Management Education, Graduate School for Business Administration, 1735 Washtenaw Ave., Ann Arbor, Mich. 48109.

Feb. 1-5, Las Vegas — **Auditing in the Contemporary Computer Environment.** Contact: Marge Umlor, EDP Auditors Foundation, 373 Schmale Road, Carol Stream, Ill. 60187.

Feb. 1-5, San Jose, Calif. — **On-Line/Real-Time Systems Design.** Contact: Jim Highsmith, Ken Orr and Associates, Inc., 715 E. 8th, Topeka, Kan. 66607.

Feb. 1-5, New York — **Structured Analysis Workshop.** Contact: Structured Methods, Inc., 7 W. 18th St., New York, N.Y. 10011. Also being held Feb. 1-5 in Los Angeles.

Feb. 1-5, St. Louis — **Analysis/Design Workshop.** Contact: Structured Methods, Inc., 7 W. 18th St., New York, N.Y. 10011.

Feb. 1-5, Dallas — **CICS/VS Application Programming (Command Level).** Contact: On-Line Software International, 65 Rt. 4 E., River Edge, N.J. 07661.

Feb. 1-5, Washington, D.C. — **Structured Analysis, Design and Testing of Computer Systems.** Contact: The George Washington University, School of Engineering and Applied Science, Washington, D.C. 20052.

Feb. 2-3, Arlington, Va. — **The X.25 Packet Network Protol.** Contact: McGraw-Hill Conference Center, Suite 3677, 1221 Ave. of the Americas, New York, N.Y. 10020.

Feb. 2-3, Orlando, Fla. — **Computer Graphics at Colleges and Universities: Applications to Curricula and Laboratory Facilities.** Contact: Martha Fort, Coordinator, 105-A H/SS, University of Missouri, Rolla, Mo. 65401.

Feb. 2-5, Chicago — **Structured Requirements Definition.** Contact: Jim Highsmith, Ken Orr and Associates, Inc., 715 E. 8th, Topeka, Kan. 66607.

Feb. 3-4, Washington, D.C. — **How to Protect Computer-Based Information and Prevent Computer Abuse.** Contact: The Bureau of National Affairs, Inc., 1231 25th St., N.W., Washington, D.C. 20037.

Feb. 3-4, Houston — **Recovery/Restart.** Contact: On-Line Software International, 65 Rt. 4 E., River Edge,

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Feb. 3-5, Denver — **Audit and Control in the Data Base Environment.** Contact: Stephanie Gaubatz, Program Manager, RHY Consultants, 1444 Balsam St., St. Paul, Minn. 55122.

Feb. 3-5, Las Vegas — **Advanced DP Auditing Concepts.** Contact: Marge Umlor, EDP Auditors Foundation, 373 Schmale Road, Carol Stream, Ill. 60187.

Feb. 3-5, St. Louis — **Microcomputers: An Overview for Managers and Engineers.** Contact: Darlene Copp, Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, Mich. 48128.

Feb. 3-5, Boston — **Network Protocols.** Contact: The American Institute for Professional Education, Carnegie Building, 100 Kings Road, Madison, N.J. 07940.

Feb. 3-5, Valley Forge, Pa. — **Managing the Disaster Recovery Project.** Contact: Devlin Associates, Inc., Suite 795, 1150 First Ave., King of Prussia, Pa. 19406.

Feb. 4-5, Orlando, Fla. — **Computer Graphics on Microprocessor/Personal Computer Systems.** Contact: Martha Fort, Coordinator, University of Missouri, Rolla, Mo. 65401.

Feb. 4-5, Orlando, Fla. — **Public and Private Packet Switched Networks — The X.25 Protocol.** Contact: The George Washington University, School of Engineering and Applied Science, Washington, D.C. 20052.

Feb. 4-5, New York — **IMS Systems Management Workshop.** Contact: Sondra Schwartz, Boole & Babbage Educational Services Division, 510 Oakmead Pkwy., Sunnyvale, Calif. 94086.

Feb. 7-9, Jupiter Beach, Fla. — **Computer Printers.** Contact: Institute for Graphic Communication, 4th Floor, 375 Commonwealth Ave., Boston, Mass. 02115.

Feb. 8, Los Angeles — **Software Documentation Under MIL-STD-1679: A Detailed Overview.** Contact: Software Management Training Institute, 31220 La Baya Drive-110, Westlake Village, Calif. 91362.

Feb. 8-9, New York — **Capacity Planning and Modeling Workshop.** Contact: Sondra Schwartz, Boole & Babbage Educational Services Division, 510 Oakmead Pkwy., Sunnyvale, Calif. 94086.

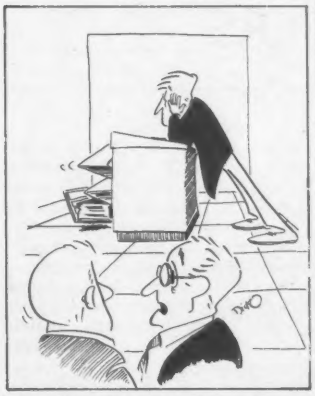
Feb. 8-9, Orlando, Fla. — **Software Quality Assurance and Verification & Validation.** Contact: Education Foundation of the Data Processing Management Association, P.O. Box 91295, 5959 W. Century Blvd., Los Angeles, Calif. 90009. Also being held Feb. 8-9 in Washington, D.C.

Feb. 8-9, New York — **OS Utilities.** Contact: Boeing Computer Services Co., 560 Lexington Ave., New York, N.Y. 10022.

Feb. 8-9, Washington, D.C. — **Office Automation: Current Realities, Organization, Guidelines for Implementation.** Contact: Datamation Institute for Management and Technology, 850 Boylston St., Chestnut Hill, Mass. 02167.

Feb. 8-9, Smithfield, R.I. — **Automating Your Office.** Contact: The Center for Management Development, Bryant College, Smithfield, R.I. 02917.

Feb. 8-10, Valley Forge, Pa. — **Advanced Disaster Recovery Planning.** Contact: Devlin Associates, Inc., Suite 795, King of Prussia, Pa. 19406.



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EDITORIAL

Weathering the Recession

The past year and the description "recessionary economy" go together in the minds of most U.S. companies. However, it seems that cutbacks did not really affect DP departments during 1981.

At least, that was the word from a number of DP managers interviewed in a recent *Computerworld* budget survey [CW, Dec. 28, 1981/Jan. 4, 1982]. Only nine of the 31 DP managers contacted indicated that their departments were hit by the recession. In most cases, the reaction was not an explanation of the effect of the recession, but rather, "What recession?"

If this is the situation, then why did Datapro Research Corp.'s recent "User Ratings of Proprietary Software" show that total expenditures for software packages in 1981 declined from the previous year? Could it be that DP departments were affected by the recession, even if the effects were less noticeable than in other company areas — or perhaps portions of the DP budget were shifted from software applications to people-related expenditures?

The majority (77%) of the DP managers contacted in the CW budget survey also projected that 1982 budgets will be larger than in 1981. It seems likely that other departments' budgets may have to be cut in order to accommodate the increases in DP.

Will the slashes made in other company departments cause further friction between DP and end users? Or is more of the data processing responsibility gradually being shifted to the end-user departments — the goal of the information center concept developed by IBM? If this is the case, then DP itself might not show large cutbacks. Instead, these reductions would be distributed among the end users that, in some cases, may be purchasing their own hardware and software.

Consultants have indicated that recession and severe cutbacks can prove disastrous for DP departments by increasing applications backlogs and making it more difficult to hold expensive, experienced professionals. It will be interesting to see how DP managers continue to escape the recessionary wrath in 1982, if indeed they were able to avoid it in 1981.

All indications are that it will be a very tight year for DP departments, with hardware and software price increases coming from IBM, and other vendors sure to follow. DP managers will have to make a very strong case for avoiding cuts in their departments and, at the same time, provide their end users with the kind of service that will encourage them to support the DP department when the budget cutting ax threatens to fall.

'Not to worry, Chief; we wrote a lottery program to select the winners.'

DATA PAST

Five Years Ago
Jan. 17, 1977

WASHINGTON, D.C. — A top IBM official huddled with the head of the Antitrust Division of the Justice Department here, apparently seeking to outline terms that might lead to a settlement of the government's eight-year-old antitrust suit against the firm.

At the same time the secret meeting was held, the four Cabinet appointees with IBM connections underwent questioning by the Senate on their qualifications for Cabinet posts. The meeting was between Nicholas Katzenbach, general counsel for IBM, and Donald Baker, head of the Antitrust Division.

Ten Years Ago
Jan. 12, 1972

WASHINGTON, D.C. — A battle was shaping up between the Federal Bureau of Investigation and agencies on the state and local levels over the control and management of police systems tied into the FBI's new National Criminal History System data bank.

Several organizations and "hundreds" of individual localities have complained that new FBI security regulations only lead to waste, with no security improvements.

The regulations required any computer handling criminal histories be dedicated to law enforcement use under the control of officials.

LETTERS

Rating the Ratings

Despite several articles in the past two years critiquing the principal software rating services, these ratings continue to be widely distributed and publicized. Therefore, I feel the need to restate and reemphasize why *not* to use a rating to choose a software package.

My view can be stated simply. Current software rating services stray significantly from the norms that dictate statistical soundness and, therefore, their ratings have little likelihood of accurately representing the "value" of various software packages. Furthermore, because of the nature of the software marketplace, I believe that an accurate and useful rating of all software packages is economically unfeasible.

Since the environment in which a software package operates may profoundly affect its functioning and evaluation, a separate rating may be needed for each type of environment. In statistical terms, this means that the survey should control for variables such as hardware, interfaces, technical staffing and the like. In practical terms, it means each package may need several different numerical ratings.

In order for ratings to be comparable to each other, a package should be rated by at least similar personnel positions at each survey site and technically should be rated by the same people.

Furthermore, the choice should be in an appropriate position to rate the package. For applications packages, for instance, the ratings might be more appropriate if done by the program user rather than a DP professional and would probably be best if done by both positions at each site.

For a survey to be statistically sound, not only must it have a large number of total respondents, but there must be an adequate number of respondents in each subsample population (in other words, package rating).

A very liberal rule of thumb is that there should be 20 to 50 responses in each subsample, although most statisticians would demand 100 or more. In one of the ratings published in 1980, one-third of the packages had only three responses! The accuracy of these ratings is so uncertain, in fact, that if 68% or 90% confidence intervals were given for each rating rather than a "precise" number, few packages would appear decidedly higher or lower than the others in ratings.

In order for a survey to be unbiased, the survey must be conducted in such a way that the sample is appropriately drawn. In a case such as this where the subsamples are of unequal size — (there are varied numbers of installations of each package), a simple random sample will probably not be the appropriate method to obtain a good selection of responses on both widely and rarely installed packages.

Also, response rates to the survey must be high enough so that the respondents can be assumed to represent an unbiased, representative portion of all the people sampled. While both rating services have response rates of around 40% — which is a great improvement over several years ago — most statistical texts state much higher percentages as being needed to counteract bias.

Alone, any of the aforementioned survey problems would cast doubt on the accuracy of a survey's results. Together, they should be considered a serious statement concerning the usefulness of these ratings. Admittedly the rating surveys have improved over the years, but these minor improvements do not make them even close to being statistically acceptable.

The nature of software and the software marketplace probably make directories or consultants necessary for most software purchases. But at-

(Continued on Page 48)

THE DATA CENTER /John P. Murray

The Question of Data Control

Much has been written about distributing both the power of data processing and data itself to those who have the most immediate need for that power and data. The increasing demand for information, coupled with growing project backlogs and shortages of personnel in most management information systems (MIS) departments, makes such action mandatory.

The obvious answer is to install any number of minicomputers and allow everyone to do their processing. Certainly there is a place for the small computer; it fits the needs of many users.

But while the use of small computers is often cost-effective and many of the needs of those who use them can be effectively met, concern with control of data cannot be ignored.

Organization Resource

Data is an organization resource. Questions of control, security, backup and availability of data cannot be treated in a cavalier manner. Often, in the euphoria associated with the installation of the small processor, this consideration is overlooked. Problems may come back to haunt the management of the MIS department — even though it may not be culpable.

The Foreign Corrupt Practices Act of 1977 places a particular responsibility on the management of an organization for the correctness and control of the organization's data. This is a responsibility that is shared by the management of the MIS department.

It is imperative that organizational critical data be adequately protected. Because of this requirement, an objective criteria must be developed in order to identify that organizational critical data and to establish effective controls to protect that data.

For the purpose of this identification, the data can be divided into two categories. One category is data that has a very limited use and no empirical value. Examples would include data used by an individual or a single department to pose and address specific questions. Once these questions have been answered, the data would have no further value and need not be retained.

Other examples include distribution studies, market forecasts, modeling and simulation projects and other "scratch pad" applications.

'What will almost certainly happen is the department manager, faced with the situation, will issue an urgent call for help from MIS. "After all," the manager will claim, "we aren't data processors; we can't operate this system." While MIS management can contend they have no responsibility for the system, if it is important enough or can be made to appear important enough, the problem will accrue to MIS.'

Because of the limited use and constantly changing nature of the output, this data, albeit important, does not represent data that must be protected and secured.

The second category is data that is used for input to these applications, such as order, customer and marketing information. Because of its organizationwide implication, this data must be protected.

General ledger, accounts payable, stockholders records and inventory information are examples of "organizational data." Where "one time scratch pad" processing is being utilized, use of the minicomputer allowing the individual to go his own way is appropriate. The MIS department needs to exercise caution where "organizational data" is concerned.

How can MIS management overcome this dilemma? How can the processing power be extended to those who need it, yet assure protection of the organization's data? One approach is to make "interactive service" available.

For example, by providing a capability such as IBM's Conversational Monitoring System (CMS), the full range of the organization's data can be made available, yet at the same time it can be secured. Copies of the existing data can be provided to MIS clients, removing the requirement in many instances to rekey data. In addition, the power of the large mainframe and huge disk capacity can be provided for processing too large for a minicomputer.

Why be constrained by the limitations of a small processor when you can have the power of a large system?

Using CMS, or a similar product, the data center can provide power, copies of the data, technical assistance when required and maintain control of the data. The client, on the other hand, has the ability to get his job done on an independent basis.

It is not an exaggeration to consider a scenario where, through the installation and use of a minicomputer (and perhaps quite unknown to MIS management), a system has been built and has now become an integral part of a department's, or even worse, the entire organization's operation.

Now, the employee who programmed the mini and did all the operating (because it was so easy) leaves the organization. This is when the management of the department will discover there is no documentation. They may not recall at this juncture that one of the "benefits" of this small system was not being involved with MIS "red tape."

What will almost certainly happen is the department manager, faced with the situation, will issue an urgent call for help from MIS. "After all," the manager will claim, "we aren't data processors; we can't operate this system." While MIS management can contend they have no responsibility for the system, if it is important enough or can be made to appear important enough, the problem will accrue to MIS.

No Perfect Solution

This is not to say there is no extra expense or red tape in the typical MIS function. It is not an attempt to claim that all MIS operations are well-documented or that they can handle their problems without difficulty. MIS management often finds itself faced with the problem of an employee who has left without providing proper systems documentation. When this happens, the manager has no one to blame but himself; being put in that position by someone else is an entirely different matter.

MIS management cannot and should not fight distributed processing; it will occur. Small processors are an appropriate solution to many problems. However, they are not a panacea. MIS management, if it is to survive, must be responsive to the needs of the organization.

Production of information that will drive the organization must be the MIS goal. However, in the rush to deliver that information, the ongoing viability of the organization must not be placed in jeopardy through inadequate protection of its data.

Murray is director of management information services for Ray-O-Vac Corp., Madison, Wis. He is responsible for worldwide MIS activities. Murray has 20 years of DP experience, 10 of which have been devoted to the management of data centers.

HUMAN CONNECTION /Jack Stone

'Problem DPer' Reforms for the New Year

Several months ago, I reported on a letter from a "problem DPer," one who confessed continuing "failure" during a 12-year stint in the business.

Well, I have a confession, too. Although my comments on the letter were serious, my underlying reason for publishing it was to ridicule and to chide — not this DPer, but the myriad data processing managers and supervisors who have perpetuated the current widespread, abysmal state of employee relations throughout the industry.

I (and many others) have written about the problem, trying every which way from Sunday to argue for change, but my impact — after five years of writing and talking about it — has been vanishingly close to zero.

Surely DP managers are born with human sensitivities and abilities to communicate with the human race, but during everyday operations they sure get lost in the noise level. Maybe this explains why well-packaged minis and micros are flocking into user departments — because users are sick and tired of trying to communicate with DP managers. And maybe this explains why so many DPers are frustrated and unhappy in their jobs.

Career Turnaround

Well, I'm very pleased to report that this particular problem DPer's career has turned around.

In this second letter, he attributes his success to his manager, one who, in my words, acknowledges his existence, sincerely cares about his performance and his future and acts decisively to develop his employees. Here is what he had to say:

"Let me tell you about a small DP shop that's almost perfect.

"Here at my new company, I have finally found an environment where I fit in and function as a productive employee. My boss is a bright, hard-working and tactful manager. He is a well-respected, energetic 'nice guy' who gets 100% from his staff. We are instituting a complex data base management system for customer billing on a mid-size mainframe. I am one of two members of the systems staff.

"My boss interfaces with the user community and I provide the technical expertise for design and development. Programming is performed by the three of us and our output is prodigious, to say the least.

"I don't fully understand why I am doing well after 12 years of failure, but I suspect that my boss is the major factor. He has been able to keep me productive by always providing a clear picture of his expectations. Daily status reviews and planning sessions are held in the morning where we discuss our daily and weekly objectives. He treats me as a professional and a friend. Although my salary is less than half of what it was before, I wouldn't trade this job for any other I've had."

Good Management the Key

"Just thought you would like to know that a successful manager can instill the proper attitude in his employees if he really cares and takes the time. Also, the manager should work with employees and always be willing to help.

"As I write this, I am suddenly struck with a thought: My boss is the first one that I have held in high regard."

Letters to Stone should be addressed to him at Box 207, 1377 K St., N.W., Washington, D.C. 20005.

LETTERS

(Continued from Page 46)

tempts to rate these products numerically seem to benefit neither the software industry nor the consumers and could potentially harm a consumer who relied on them in choosing a package, or a company whose product was unfairly rated, or omitted, from a survey.

These firms state that the ratings provide good publicity for the software package industry, but the industry has demonstrated that it can promote itself well.

It would better serve all concerned if the firms concentrated their efforts on directories rather than ratings.

Julie Johnston
Director of
Research & Statistics
Association of
Data Processing
Service Organizations, Inc.
Arlington, Va.

Credit for Invention

In "Happy Birthday, Mr. Chip" [CW, Nov. 16], the article gives credit to Intel Corp. as the first to invent and the first to develop a microprocessor. In fact, Texas Instruments, Inc. was the first to invent the microprocessor, as indicated by U.S. Patent No. 3,757,306 granted to TI.

Texas Instruments demonstrated a fully operational microprocessor in March of 1971 and published the results in *Electronics* magazine on June 7, 1971, five months prior to the Intel announcement. The *Electronics* article was entitled "The CPU Chip Turns Terminal Into a Stand-Alone Machine."

We hope you will take the above into account in regard to future references to microprocessor history.

Norman P. Neureiter
Manager,
Corporate Relations
Texas Instruments, Inc.
Dallas, Texas

Soviet Threat?

In the article "Awacs Not Exactly State-of-the-Art: Experts" [CW, Oct. 26], the statement was made that "no 370 series computers have ever been sold to Eastern Europe or to the USSR."

Perhaps this statement needs some clarification. It is my belief that both the Czechoslovakian and Polish governments, both Eastern bloc countries and both predominantly Soviet-controlled, do indeed have at least one IBM 370 — a 148 — and possibly by now even more.

G. Gramm
Port Coquitlam, B.C.

Lesson to Be Learned

I can't recall offhand the article referred to in Camille Kostosky's reader commentary ["Programmers Don't Need to Communicate in English, CW, Dec. 7]. I can only hope that she misinterpreted it.

However eloquent the arguments, the fact remains that we live in — in fact are creating — a world in which communications skills are of ever increasing importance. Yes, we do need those who are able to "create an advanced stock market analysis program," but they must also be able to understand the advanced program they are to create.

The demands placed on today's computer professionals are two-fold: We must be able to communicate with the users as well as with the computers. Perhaps the analogy of a foreigner speaking only one language would be apropos here.

Since when is knowledge of two fields mutually exclusive? Can't a child be taught programming as well as English? Is a brain taking on the attributes of a computer in that we run out of disk space if we try to learn too much?

I guess it's time we took lessons from Madison Avenue: What do we want, good grammar or good programming?

The whole point of this diatribe is not to point fingers. It is to try to show that communications skills are important to each of us now and will become more so through time — not only in terms of social change, but also in career advancement. We must speak the language of the boardroom as well as the computer room.

Is it too much to expect that English-speaking people are able to speak English?

Gerard J. Prost
Administrative
Systems Analyst
Lear Siegler, Inc.
Santa Monica, Calif.

READER COMMENTARY / Walter E. Ulrich

When Is a Consultant Not a Consultant?

There is something wrong in data processing consulting. A recent issue of the *Houston Chronicle* classified section ran two advertisements that pointed up this problem.

Neither advertisement listed any requirements for data processing experience. One, for a computer consultant trainee, read in part: "High income and rapid advancement are available to those who wish to be number one. No experience necessary."

Another ad read: "Leading national corporation has a key opportunity for a self-motivated professional. Selected individual will be trained to act as a consultant to data processing managers."

There is something wrong when high income and the desire to be No. 1 are the primary qualifications for a consultant. There is something wrong when a leading national corporation is willing to train individuals to *act* as a consultant. There is something wrong when people with no experience can earn high income and rapid advancement in a profession as complex as ours.

Consulting is a high and honorable profession. A consultant is an experienced and trained individual whose personality is well suited to understanding client situations. The consultant listens well and gives advice objectively, independently and professionally.

There are a small number of such consulting firms that serve the data processing industry. Information and its management is changing so fast that it is unrealistic for any organization to have all the answers. Even the most sophisticated companies turn to consultants for an independent, fresh look at their plans and strategies.

Objective Review

An objective review of management methods can be a great source of improvements and new ideas.

In addition, consultants can provide specialized expertise or, simply, additional resources to meet peak requirements. For these reasons, and many others, management consulting in data processing and information systems makes sense.

By most standards, our industry is in its infancy. And yet, it is evolving at an accelerating pace. The demand for consultants is high and the supply is low.

Less Than Qualified

Unfortunately, certain companies are trying to fill this gap with less than fully qualified people. And in some cases, the offenders are the biggest and best-known names. When is a consultant not a consultant?

- A consultant is not a consultant when the individual lacks practical experience. You cannot advise a data processing manager unless you have had successful data processing management experience yourself.
- A consultant is not a consultant when the company worked for has any financial interest in the advice given. An advisor cannot be expected to be unbiased if the firm sells any hardware, software or programming products or services. A firm selected for studies and evaluations should be one that sticks strictly with consulting.
- A consultant is not a consultant when the firm is also the CPA for the client company.

Because computer consulting is such an integral part of record- and bookkeeping, a CPA firm that gets too involved in computer consulting endangers its independence and objectivity as auditor. A healthy audit relationship can be impaired if the audit firm is used for computer management advi-

(Continued on Page 50)

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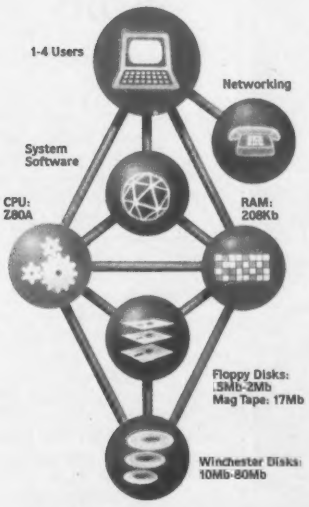

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LETTERS

Self-Inflicted Wound

Camille Kostosky's reader commentary ["Programmers Don't Need to Communicate in English," CW, Dec. 7] was thought-provoking because she stated her case sufficiently clearly for the incorrect conclusions to stand out and be answered.

When a person professes to be skilled in one intellectual pursuit (for instance, computer programming) and then displays a gross lack of discipline in another (such as writing English), then when he is discredited, it is a self-inflicted wound.

If, as is often the case, the recipient of the writing is qualified to evaluate the English but not the programming, he will quite reasonably generalize from one to the other by induction. The reader knows that sloppy thinking can very easily become a habit.

Kostosky states that "what we try to achieve in any language is the easiest and simplest way to get the communicatee to understand." Why then should we approach the task so carelessly and with such disdain for quality? If we first annoy the "communicatee" thoroughly it will be more difficult to make him understand.

There is no use for castigating the critic of bad writing nor for comparing him to a child making fun of a foreigner's speech. The analogy does not fit. The foreigner's deficiency in proficiency is presumed to be due to lack of opportunity rather than lack of intelligence.

However, the programmer presents himself as being skilled with languages for computers. If he cannot write clearly or speak clearly, why should anyone risk the company's funds on the possibility that he might program clearly?

David L. Shuman
Systems Analyst
First Savings and Loan Association of Central Indiana
Anderson, Ind.

Case for Illiteracy?

I was surprised with Camille Kostosky's reader commentary [CW, Dec. 7] on programmers not needing to master language skills. It amazes me that anyone can make a case for even mild illiteracy.

I agree that technical people generally communicate well among themselves. The forgiving nature of the spoken word and their common background makes this possible. Sadly, we are not always in a situation where we are dealing with our peers.

True, there is a need for technical writers with highly developed communications skills. These people will mold the writing of the technicians into a final form. If they are to do this effectively they must have some minimal level of quality input.

We all must work to develop high quality communications skills. As trends toward user-friendly software increase, the demand for the "supertech" will decrease. What will be required is the well-rounded employee who is able to deal with others on their own ground. Those who cannot will be left behind.

Richard H. Finn
Product Manager
The First National Bank of Chicago
Chicago, Ill.

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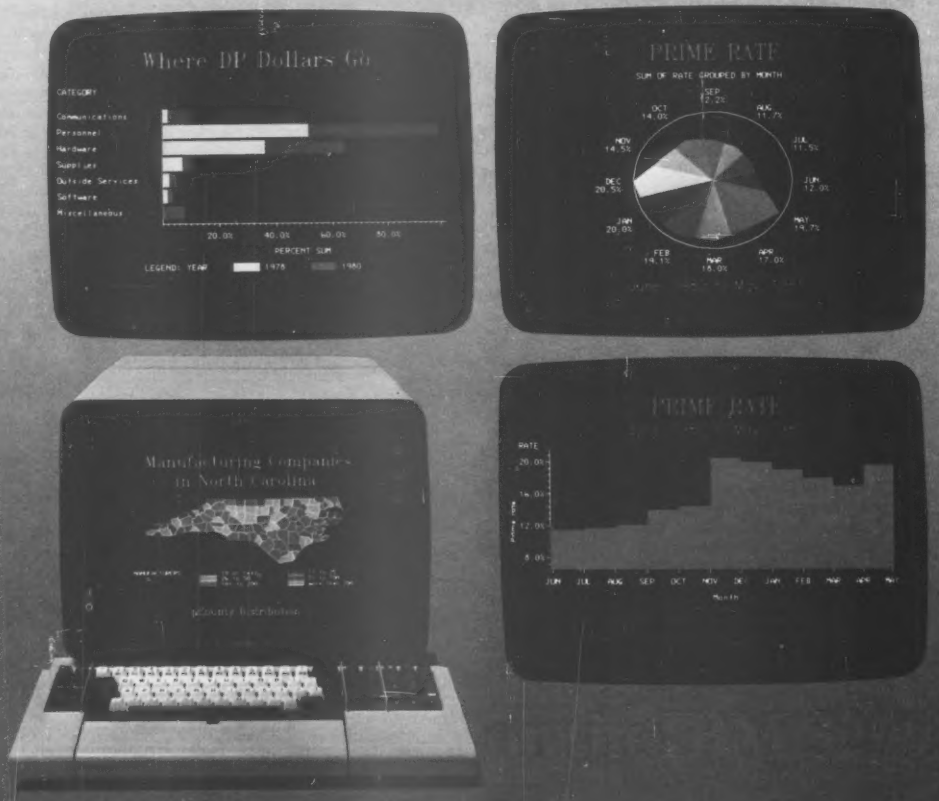

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Images produced by SAS/GRAPH with IBM 3279 and Dunn Instruments 631 Color Camera System.

Consulting Role

(Continued from Page 49)

sory services.

• A consultant is not a consultant when the individual cannot provide specific references that demonstrate the consultant's expertise. Good consultants have a string of top references. Many clients rightly insist on talking to a number of references and question them closely.

A computer consultant might be retained in just about any company. In fact, a company that never uses consultants is overlooking an important and productive resource.

Balanced against the costs of recruiting, retaining and maintaining the skills of top people, a good relationship with a real consulting firm is an excellent investment.

Ulrich is president of Walter E. Ulrich Consulting, a Houston-based management and technology consulting firm.

His firm is active in the Association of Data Processing Service Organization, Inc.

DP Novices Gain System For Modeling

ANDOVER, Mass. — Software International Corp. has introduced a Forecasting, Modeling and Reporting System said to be usable by people without DP experience.

The system reportedly can be used for preparing budgets, financial analysis, production schedules and market forecasts.

Generating a report is a three-step process, according to the vendor. First, a rough layout of the report is sketched out on paper to determine page headings, columns and what types of calculations are to be performed on what data.

Second, the information in that rough layout is entered into the system. Third, a single command causes the report to be output.

A built-in error-detection feature flags errors by line.

Running on large IBM mainframes under OS, the software costs $31,000 from the firm at Elm Square, Andover, Mass. 01810.

'O-W-L' Procs Sub for 'ICCF'

ATLANTA — NCI, Inc. has released a group of conversational procedure languages (Proc) said to allow a user of O-W-L, its on-line source maintenance system, to do DOS/VSE systems generation and maintenance without IBM's Interactive Computer Control Facility.

The first is a set of O-W-L conversational Procs that provide the basic functions offered by IBM's Interactive Productivity Facility.

The second set of conversational Procs reportedly assist in the installation of VSE system components and generate the necessary VSE/JCL and Maintenance of the System History File control statements to perform such functions as installing IBM features and MSHP.

The Procs are free to O-W-L users. The basic O-W-L costs $13,800 from NCI, 3720 Longview Drive, Atlanta, Ga. 30341.

Commercially Available

Relational DBMS Compared

By David Upham
Special to CW

Four currently or soon-to-be available relational data base management systems are examined and compared here by David Upham, president of Relational Data Base Associates, Inc. in Seattle. Upham focuses on Ingres, which was developed by Relational Technology, Inc.; Britton-Lee, Inc.'s Intelligent Data Base Machine (IDM-500); IBM's SQL/DS; and Oracle from Relational Systems, Inc.

In the past 10 years, relational data base management has progressed from theoretical papers to commercially available systems.

As defined, a relational data base management system (DBMS) provides a group of data manipulation operators that act upon tabular data. These operators relate data stored in different tables, based on values inherently contained within the data and not on externally defined relationships.

Consequently, it is the data language used by a particular system, rather than the physical storage mechanism, that determines whether it is relational.

Ingres was originally developed at the University of California at Berkeley and employs the relational data language Quel.

Britton-Lee, Inc. developed the Intelligent Data Language (IDL), based upon Quel, and the two are very similar. SQL/DS is the commercial result of the much-published System R project.

System R was developed at the IBM San Jose, Calif., Laboratory, along with a relational data language called Sequel.

The data language implemented in System R was a modified version of Sequel known as the Structured Query Language (SQL). Oracle was developed using the Sequel syntax as the basis for its data language.

System Comparisons

Of the four systems, two have data languages based upon

(Continued on Page 52)

Language Compiler

Marathon, Unix Gain Report Tool

SUNNYVALE, Calif. — A report writing language compiler called ACE was announced here by Relational Database Systems, Inc.

ACE is said to enable users of the vendor's Marathon relational data base management system (DBMS) to produce report programs easier than with conventional programming languages.

Both the Marathon DBMS and the ACE language were designed to work in conjunction with the Unix operating system and Unix look-alikes, the vendor said.

The formatting features of ACE reportedly include hierarchical sorting, sort break control, automatic page header and trailer printing and adjustable page lengths and margins. ACE also is said to provide for arithmetic expressions that can involve automatically calculated aggregate values such as TOTAL, AVERAGE, COUNT and PERCENT.

ACE's other features include parameter passing, user variables and assignment statements, the vendor continued. An IF-THEN-ELSE statement also is provided.

The pricing for ACE begins at $2,000 for users of the Marathon DBMS on 16-bit microcomputers.

Marathon is priced at $4,000. Prices for larger machines are slightly higher, the vendor said.

The firm is located at Suite 503, 1208 Apollo Way, Sunnyvale, Calif. 94086.

IBM Package Backs Project Control

WHITE PLAINS, N.Y. — IBM has announced the Conversational and Interactive Project Evaluation and Control (Ciprec) package, designed to enable managers to interactively allocate resources to control stages of a project.

Ciprec is intended for use with applications such as road and building construction; engineering of military, aerospace, shipbuilding and mining projects; research and development of space projects; and planning of advertising campaigns.

Ciprec runs on IBM 370, 4300 and 30 series processors. Utilities for converting from IBM's Project Analysis and Control System and Project Management System to Ciprec are included with the basic package.

The basic Ciprec package contains time scheduling, progress reporting, data management functions and project utilities. The extended package provides a resource allocation module and both basic and sophisticated cost accounting and financial planning capabilities, the vendor said.

Both packages will be available in the fourth quarter. Monthly charges range from $604 to $1,081, depending on the version selected, IBM said from 1133 Westchester Ave., White Plains, N.Y. 10604.

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W201

Four Relational Data Base Systems Compared

(Continued from Page 51)

Quel and two are based upon SQL. Since both Quel and SQL are considered "relationally complete," there is no intention to compare their syntax nor to show how either language performs the relational operations necessary for completeness (selection, projection, cartesian product, union and difference).

'All four systems provide a level of capability sufficient to support general data management requirements.'

Table 1 provides a comparison of data definition, data manipulation and data control facilities. All four systems support concurrent access from ad hoc users and applications programs. Except where noted, all features are supported dynamically, meaning that they can be executed in the ad hoc environment.

Table 2 compares other general capabilities such as transaction management, indexing techniques and programming languages supported by the DBMS. It should be noted that the IDM-500 is a back-end data base machine capable of supporting multiple host computers. Consequently, support for specific computers, operating systems or programming languages is not applicable to the IDM-500.

It should be apparent from the two tables that all four systems provide a level of capability sufficient to support general data management requirements.

The specific system to be used depends on the host computers, operating systems and programming languages being supported and on any additional features offered by system vendors (such as data base load and unload facilities, ad-hoc interfaces, report generation programs and so on).

Feature	SQL/DS	Oracle	Ingres	IDM 500
Data Definition Support				
Variable Length Rows	Yes	Yes	Yes	Yes
Null Values Supported	Yes	Yes	No	No
Dynamically Add New Columns	Yes	Yes	No	No
Support Stored Commands	Yes	No	No	Yes
Dynamic View Definition	Yes	Yes	Yes	Yes
Automatic Elimination Of Duplicate Rows	Optional	Optional	Yes	Optional
Dynamic Data Base Expansion	Yes-Utility	Yes-Utility	No-O/S Function	Yes-Command
Data Manipulation Support				
Storage of View Text	Yes	Yes	Yes	No
Append Table to Itself	No	No	Yes	Yes
Support for User Files	No	No	No	Yes
Specify Disk the Table Is To Be Placed On	Yes	No	No	Yes
Maximum Size Char. Field	32767	255	255	255
Define Synonyms	Yes	No	No	No
Sort Query Results	Yes	Yes	No	Yes
Data Conversion Functions	No	No	Yes	Yes
Help Facility	Yes	No	Yes	N/A
Integrity Constraints	No	No	Yes-Single Table	No
Three-Walking Syntax	No	Yes	No	No
Outer-Join Syntax	No	Yes	No	No
Data Control Facilities				
Access Permission for Tables and Views	Yes	Yes	Yes	Yes
Permission Structure	Decentralized	Decentralized	Centralized	Centralized
Resource Authorization	Yes	No	No	Yes
Password for Data Base Access	Yes	Yes	No	No

Table 1 — Data Definition, Data Manipulation and Data Control Facilities

Feature	SQL/DS	Oracle	Ingres	IDM 500
Index Support				
Primary Index Required	No	Yes	No	No
Support Dynamic Index Def.	Yes	No	Yes	Yes
Support Multicolumn Indexes	Yes	No	Yes	Yes
Support Variable Length Keys	Yes	Yes	Yes	Yes
Physical Ordering of Data (Clustering)	Yes	Only on Initial Load	Only on Initial Load	Yes
Change Clustering Index	No	No	Yes	Yes
Locking				
Levels	Row, Page, Table, Data Space	Row, Table	Table	Page, Table
Automatic Lock Escalation	Yes	No	No	Yes
Storage Statistics Available	Yes	No	Yes	No
Optimization				
Access Method	Compiled	Interpretive	Interpretive	Interpretive
Path Selection Methods	Evaluate Indexes, Scans, and Two Join Methods	Evaluate Indexes	Evaluate Indexes, Scans, and One Join Method	Evaluate Indexes, Scans, and One Join Method
Transaction Management				
Mult. Statement Transactions	Yes	Yes	No	Yes
User-Controlled Backout	Yes	No	Yes	Yes
Support Nested Transactions	No	Yes	N/A	No
Disk Recovery Techniques	Roll Forward & Backout	Roll Forward	None	Roll Forward & Backout
Host Language Interface				
Type	Precompiler	Call	Call	N/A
Languages Supported	PL/I, Cobol and Assembler	Fortran, Cobol, PL/I, "C" and Assembler	Pascal and "C"	N/A
Support for Multiple Cursors	Yes	Yes	No	N/A
Computer Environment				
CPUs	43XX, 370, 303X	PDP 11/XX, VAX	VAX	N/A
Operating Systems	VSE	RSTS, RSX-11M, IAS, Unix, VMS	VMS	N/A

Table 2 — Comparison of General Capabilities

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Users Group Established for Cobe System

MILWAUKEE — Users of Cobe Corp.'s Mortgage Information Management System have formed a group to discuss new applications and developments and to set up a formal line of communications between the software's users.

Cobe's software is a generalized data base management system geared to run on Wang Laboratories, Inc.'s 2220 computer system.

At its first meeting, held last month in Madison, Wis., the group elected Charles Nugent of the Mutual Savings and Loan Association of Milwaukee as president and Carl Manns of First Financial Savings and Loan Association of Stevens Point, Wis., as secretary/treasurer.

Presently the group claims to have approximately 50 members, representing about one-half of the users of Cobe's data base management software.

Additional information on the group can be obtained from Charles Nugent, Mutual Savings and Loan Association, 510 E. Wisconsin Ave., Milwaukee, Wis. 53202.

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For IBM: 100 and 200 MB 12-high packs, top and front-load single disk cartridges.
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'Mark IV ADS' Release Includes 260 Features

CANOGA PARK, Calif. — Release 9.0 of Informatics, Inc.'s Mark IV Application Development System (ADS) has been announced here by the vendor. Enhancements include a data base transparency option, increased reporting flexibility and improved Vsam file support.

The new release is said to include 260 enhancements designed to increase programmer productivity and provide improved systems performance for batch applications. Operating environments for Mark IV ADS include IBM and plug-compatible mainframes running under OS/VS, DOS/VS, DOS/VSE and CMS.

One enhancement is the Generalized Data Base Interface (GDBI), which is a separately priced option to enable application programmers to transparently process data bases (see story below).

In the area of report production, Release 9.0 enhancements are said to affect all aspects of reporting, including title, column and summary sections of a report; calculations on summaries; variable page and column data; output of a skeleton report when no data is selected; and a new "branch-if-true" operator.

With Release 9.0, multiple Mark IV ADS libraries now can be accessed, the vendor said. In addition, the order in which the libraries are searched can be specified, and Vsam libraries now are available to OS/VS and CMS systems.

Other operational enhancements reportedly include expansion of IBM DL/1 Hierarchical Direct Access Method file support and the addition of IBM IMS checkpoints. A DDNAME override capability has been added for OS users.

Release 9.0 will be provided free of charge to all current Mark IV ADS users who are under software support with Informatics via an Annual Improvement, Maintenance and Support agreement, except for GDBI, which will cost $10,000 for OS environments of Mark IV ADS. The base price of Mark IV ADS in the U.S. and Canada is $35,000. Delivery is immediate.

Informatics is located at 21050 Vanowen St., Canoga Park, Calif. 91304.

Option Gives Programmers Transparent Access to DBMS

CANOGA PARK, Calif. — Generalized Data Base Interface (GDBI), an option for its Mark IV implementation system, was announced here by Informatics, Inc. to provide application programmers with transparent access to data base management systems (DBMS).

With GDBI, Mark IV reportedly can be used for batch processing with any type of file or data base. The vendor said that because GDBI is transparent to the application program, the programmer does not need to know call sequences, strategies and techniques that are handled by a user-written mapping request.

GDBI also features selective record and segment processing, which is designed to optimize system resources and reduce system overhead. System security reportedly is provided with GDBI through selective data mapping in the mapping request, through support of the operating system password protection facilities or with a Mark IV password.

Other Features

Other features of GDBI are processing of logical records greater than 32K bytes and variable-length fields in the DBMS, the vendor said. Application requests are said to be independent of DBMS changes.

GDBI is designed to run on IBM and plug-compatible mainframes operating in OS/VS, DOS/VS, DOS/VSE and CMS environments. The base price in the U.S. and Canada for the OS/VS version of GDBI with Mark IV is $10,000. GDBI also is available for the Informatics Answer/2 report writer, and the base price for the OS/VS version is $6,500.

The package is ready for immediate delivery with Release 9.0 of Mark IV and with Answer/2, the vendor said from 21050 Vanowen St., Canoga Park, Calif. 91304.

VS/9 Utility Allows Move to 8450 Disk

DARTMOUTH, Nova Scotia — A utility for Univac VS/9 computers that reportedly allows users to move data from an 8433-type disk to an 8450-type disk in less than 30 minutes has been announced by Cosmopolitan Software Services Ltd.

The MIG50, when used in conjunction with the firm's Powerdump/Restore backup and recovery utility, is said to save time and money in such an upgrade.

MIG50 costs $5,000 for U.S. users from Cosmopolitan Software Services, Suite 806, Queen Sq., 45 Alderney Drive, Dartmouth, Nova Scotia, Canada B2Y2N6.

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Random Notes

Program Development Aid Out for Datapoint Users

GREENSBORO, N.C. — A program development aid for users of Datapoint Corp. computer systems has been announced by The Innovators, Inc.

Innopak consists of the firm's two on-line design and coding aids: CRTgen and Printgen. Once a format is completed both programs write Databus macros, such as key-in and display macros, according to a spokesman.

Innopak costs $3,500 from the firm at 3408-I W. Wendover Ave., Greensboro, N.C. 27407.

Cortex Unbundles 'Inform,' Offers Leasing Plan

WELLESLEY, Mass. — Cortex Corp. has unbundled its applications development system, Inform, for users of Digital Equipment Corp. VAX-11/780 and 750 and PDP-11/70, 11/44, 11/24 and 11/23 processors.

In addition, Cortex offers Inform on a lease basis for less than $1,000/mo. With unbundling, the firm prices Inform licenses from $6,000 for the PDP-11/23 to $19,000 for the VAX-11/780. License fees include documentation, remote installation and 90-day remedial service.

Cortex is located at 55 William St., Wellesley, Mass. 02181.

Interactive Tool Analyzes Lease Structure Economics

BURLINGAME, Calif. — An interactive software program designed to analyze the economics of leveraged and nonleveraged equipment lease transactions is available via General Electric Information Services Co.'s international teleprocessing network.

Developed and maintained by All Type Equipment Leasing, Inc. (Atel), LEA2 reportedly helps financial institutions price and structure individual leases to produce economic results including various yield and profit analyses.

The software is available on an as-used basis. Atel is located at Suite 360, 1350 Bayshore Highway, Burlingame, Calif. 94010.

Comparative Study Offered On IBM Series/1 Software

SPRING HOUSE, Pa. — Whelan Associates, Inc. is offering a comparative study of data management and report generation systems for the IBM Series/1 system under the Event Drive Executive operating system.

The study reviews each known system against a standard set of criteria as well as providing price and vendor information.

The charge for the study is $50 and is available from the company at Box 650, Spring House, Pa. 19477.

'I/Term' Package Update Gives Off-Line Versatility

WESTPORT, Conn. — Infosoft Systems, Inc. has announced a new version of its I/Term telecommunications package said to allow off-line data entry, editing and preprocessing for remote computer service or time-sharing users.

I/Term reportedly has provisions for communicating between the user's computer and any time-sharing system. It is said to allow the user to receive or transmit from disk without special timing or operator commands.

I/Term receives and transmits either directly or on remote commands using standard Teletype Corp. ASR-33 conventions. The updated I/Term costs $95 from 25 Sylvan Road S., Westport, Conn. 06880.

IBM System/34 Version Of Financial System Out

CHICAGO — EPS, Inc. has developed an IBM System/34 version of its FCS-EPS financial planning system.

The System/34 version includes all basic financial modeling functions, three-dimensional hierarchical consolidation and cross-sectional reporting capabilities, the vendor said.

Prices start at $35,000 for single copies, but can drop to $5,000 each for multiple-site installations, a spokesman said from Suite 590, 8600 W. Bryn Mawr Ave., Chicago, Ill. 60631.

Display Procedure Offered For IBM System/34 Files

HERMITAGE, Tenn. — BM Systems, Inc. is offering Kdisplay, a procedure that displays all or part of an indexed file in key sequence for IBM's System/34.

It is similar to IBM's Display procedure that displays files in relative record number sequence.

The product supports first and last key parameters, which may be generic, up to 29 bytes long and contain imbedded blanks; files with packed keys; Evoke or JobQ options.

The procedure is priced at $35 from the vendor at 5980 Port Anadarko Trail, Hermitage, Tenn. 37076.

Purchasing Aids Released For Accountants, Vendors

NEW YORK — Sourceware, Inc. has announced Version 1.2 of its Library Maintenance Utility, a full-screen text editor for IBM's System/34.

Version 1.2 gives users the ability to maintain members drawn from more than one library during a single editing session. Source programs are available as an option with this release, the vendor said.

Version 1.2 costs $600, the vendor said from 204 W. 20th St., New York, N.Y. 10011.

Library Maintenance Utility Gets Text Editor Version 1.2

ATLANTA — GMD Systems International, Inc. has announced a purchasing system for accountants and certified public accountants working on the IBM System/34.

A purchasing package for materials-oriented vendors was also announced. Features include purchase-order writing, tracking and status monitoring, the vendor said.

The fixed asset package costs $4,800. The purchasing system costs $2,900 for a basic package and $3,800 for a package with extended capabilities, the firm said from Suite 140, 6195 Barfield Road, Atlanta, Ga. 30328.

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'Valu-Lib' Update Fits IBM MVS, VS1 Installations

CHERRY HILL, N.J. — Value Computing, Inc. (VCI) has announced Release 4.0 of its Valu-Lib tape management package for IBM MVS and OS/VS1.

Command structures for the new release have been simplified and on-line Help facilities have been added, VCI said. Valu-Lib is said to support a variety of telecommunications systems and can be accessed simultaneously by multiple users. It reportedly offers full-screen data entry with password protection by user ID and command-level authority.

Valu-Lib enables users to inventory an indefinite number of data sets on the same volume, the vendor said. The package uses subsystem technology for real-time data protection and gathering.

With Release 4.0, Valu-Lib makes use of the standard intervention facilities in the OS/VS operating environment. VCI said its new subsystem handles communication between Valu-Lib and the operating system.

Other enhancements to Valu-Lib reportedly include expanded prestaging, on-line setup and automatic journaling. Release 4.0 is priced at $15,500, VCI said from 498 N. Kings Highway, Cherry Hill, N.J. 08034.

From Macros to Commands

'M2C' Converts CICS Cobol Programs

WABAN, Mass. — Tanit Co. has announced its M2C conversion system, which permits the conversion of IBM's CICS macro-level Cobol programs to command-level Cobol.

Tanit said programmers can save up to 60% of their time by using M2C instead of manual conversion.

M2C, which runs under DOS and OS, converts Cobol CICS macros to related CICS commands. Users can find a list of the convertible macros in the IBM *CICS Applications Programmer's Reference Manual.* Processed code should be desk checked and parallel tested, since M2C does not convert all macros or macro operands, the vendor noted.

A second release of M2C that will convert macro-level PL/I programs is planned for the spring.

The system is priced at $6,500 for a one-year lease. The lease agreement includes source language, a reference manual and installation.

Tanit is also offering off-site conversion including desk checking, but not parallel testing, for $750/program. The vendor can be reached at P.O. Box 191, Waban, Mass. 02168.

'Raps' Release Gives CICS Reports

JERICHO, N.Y. — Version 1.2 of the Remote Access Power Support (Raps) package from Express Software gives CICS users the ability to generate reports from on-line transactions to the host system or other remote CICS users.

The Raps applications spool interface provides the CICS/VSE user with the ability to produce reports directly to Power/VSE environments. Print lines are automatically buffered and passed to the Power/VSE queue by the Raps spool on a CICS/VSE printer or by Power/VSE on the systems line printer.

A user has two types of reports from which to choose: first, a continuous report that is built by many transactions over a period of time where each transaction adds pages to the end of the report and, second, a noncontinuous report that is built by only a single transaction.

Associated with those features is the capability to display on a CICS/VSE terminal the given status of any printer. The user can abort any print operation and also remove entries from the Power/VSE queue.

The three-year license fee for Raps is $3,500, Express said from 125 Jericho Tnpk., Jericho, N.Y. 11753

Job-Cost Tool Designed to Save System/34 Users Disk Upgrade

FARMINGTON HILLS, Mich. — Rand Systems Corp. here has announced an integrated accounts payable, payroll and job-costing system for IBM System/34 users. It is designed to track labor and material costs and monitor them against estimates.

The Rand Systems Corp. job-costing package includes the ability to display current costs by category for an entire job or subassembly on a CRT screen by the entry of the job or subassembly number, according to the vendor.

The software is said to provide an alternative to IBM's manufacturing, accounting and production information control system, with the addition of reduced complexity and efficient utilization of disk and memory resources, the vendor said. It was designed to enable users to avoid at least one disk upgrade on the IBM System/34.

The basic system license agreement to end users is $10,000, the vendor said from Suite 202, 30785 Grand River, Farmington Hills, Mich. 48024.

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Focus Gets VM/370 Option

NEW YORK — Information Builders, Inc. has announced the High Performance Option (HPO) for its English-language data base management system and information control system, Focus.

Focus HPO is designed for VM/370 environments with large numbers of active Focus users relative to the CPU power and real storage supporting the system, the firm said. The option is said to result in improved terminal response time and potential increase in the number of users the system can support.

The HPO version is sold as a Focus installation option starting with Focus Release 3.9 for a one-time charge of $2,500 or monthly lease charge of $65/mo, the firm said.

Information Builders is located at 1250 Broadway, New York, N.Y. 10001.

Tool Gauges CICS Response

McLEAN, Va. — Autumn Software Corp. has announced CICS/Response, a package for measuring and displaying response times for IBM's CICS.

The package gathers and displays response times for transactions or groups of transactions and terminals. Response times can be displayed for predefined hourly intervals during the day, the vendor said.

The package costs $3,000, the vendor said from Suite 1018, 8340 Greensboro Drive, McLean, Va. 22102.

Package Eyes Auto Upkeep

PHOENIX — Independent Computer Systems has announced a vehicle maintenance application package for Honeywell, Inc.'s Level 6/DPS 6 minicomputers.

The software reportedly provides an interactive maintenance package for end users with a requirement to maintain any type of vehicle. It is designed to assist parts managers to control purchasing and issuing of parts through on-line inquiries, usage and activity reports.

Immediate update to accounting is provided, the vendor said. Historical information on purchasing, customer orders and vehicle servicing can be accessed to assist managers with trend analysis, budget preparation, vendor performance and service records.

The software, written in Cobol, requires Honeywell's Gcos Mod 400 and is available for $10,000, the vendor said from Suite 106, 8686 N. Central, Phoenix, Ariz. 85020.

Directories Out For IBM Software

LOS ANGELES — Software Times has announced a line of software directories for IBM systems.

Each directory is devoted to either IBM's System/38, System/34, System/3 or System/32. The directories cover a variety of software from industrial applications and general financial planning support to programmer productivity aids and word processing, the vendor said.

The manuals cost $50 each, the vendor said from Suite 179, 1523A N. La Brea Ave., Los Angeles, Calif. 90028.

System/34 Gets Financial Modeling

WINTER PARK, Fla. — Westmoreland Systems, Inc. has announced an interactive financial modeling system for IBM's System/34 minicomputer.

Calc/34 is described as a management planning tool designed to replace calculators and columnar pads for forecasting and analysis. Users create a model by describing the rows and columns of a spread sheet and their relationships. The software, in turn, can create, store, display, print and modify models and multiple sets of data for each model, according to the vendor.

Calc/34 costs $500 from Westmoreland at Suite J, 228 Park Ave. N., Winter Park, Fla. 32789.

The $149.95 personal computer.

Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $149.95* completely assembled.

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The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under $200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

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- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only $39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

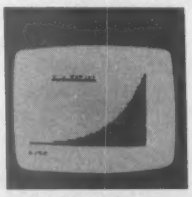
With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

Order at no risk**

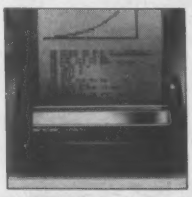
We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

**Does not apply to ZX81 kits.



NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than $100.

16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is $99.95, plus shipping and handling.

ZX81 MANUAL: The ZX81 comes with a comprehensive 184-page programming guide and operating manual designed for both beginners and experienced computer users. A $10.95 value, it's yours free with the ZX81.

Xerox Updates Fixed-Asset Tool

LOS ANGELES — Xerox Computer Services has unveiled a new version of its fixed-asset software application product, which the Xerox Corp. division offers over an on-line service network and as a package to be slipped into the user's own computer.

The product meets changes in depreciation methods mandated by the Economic Recovery Tax Act, an antirecession measure experts view as suddenly making a lot of user software obsolete [CW, Nov. 26].

An "accelerated cost recovery system" in the new version replaces the "asset depreciation range system" in previous versions, a spokeswoman said.

On-Line Conversion

Xerox Computer Services' on-line customers may convert to the modified product right away, she indicated. New customers will automatically receive the new version.

The software comes with the vendor's Spectra software product line and may be licensed to run on in-house IBM 370, 30 series, 4300 and plug-compatible processors.

The in-house license costs $10,000 while on-line access is billed on the basis of usage, the spokeswoman explained from 5310 Beethoven St., Los Angeles, Calif. 90066.

'Erisa-Aid' Handles Corporate IRAs

WAYNE, Pa. — A program for handling corporate individual retirement accounts (IRA) has been introduced by SEI Corp. Erisa-Aid features prototype plans that minimize the time needed to initiate a corporate IRA, input of contributions directly from payroll-deductions and flexible statement and reporting routines, among others, the vendor said.

Erisa-Aid is designed to allow bank trust departments to compete for the significantly larger market for IRAs now permitted under the Economic Recovery Act, the vendor said.

The system has been fully tested and is operational at 20 trust departments.

The price of the program is per participant and depends upon the contribution. For example, the charge for one contributor/year is $225; for 24 contributors/year the charge is $925.

Additional information is available from the vendor at 680 E. Swedesford Road, Wayne, Pa. 19087.

Report Systems Handle Planning, Finance Analysis

VANCOUVER, B.C. — Canadian European Systems Ltd. has announced two menu-driven, interactive modeling and reporting systems designed for use by financial- or planning-oriented individuals.

Dain 3000 operates on the Hewlett-Packard Co. 3000 series running under the MPE operating system. Dain 11 operates on the Digital Equipment Corp. PDP-11 series under the RSTS-E operating system.

The two systems can be applied to any analysis or report that is represented in a spread sheet format with typical applications of budgets, forecasts, consolidations, income statements and marketing plans.

Dain 3000 and Dain 11 are subsets of the Dainev Planning and Reporting System and are priced at $1,500, with maintenance included. Thirty-day trial periods are available from the firm at P.O. Box 2884, Vancouver, B.C., Canada V6B 3X4.

Orr Announces Methodology

TOPEKA, Kan. — A systems development methodology product has been announced by Ken Orr and Associates, Inc.

The Data Structured Systems Development (DSSD) Design Library is said to encompass three primary information engineering cycles: systems planning, development and operations.

Available in "early 1982," the library will carry an introductory fee of $23,500, including one copy of the library and five days of training or installation consulting from the firm at 715 E. 8th, Topeka, Kan. 66607.

Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just $99.95*. It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

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AD CODE 01CW11	PRICE†	QTY.	AMOUNT
ZX81	$149.95		
ZX81 Kit	99.95		
8K BASIC chip (for ZX80)	39.95		
16K Memory Module (for ZX81 or ZX80)	99.95		
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All of Mexico's computer equipment is imported, with the largest share coming from the United States. Half of Mexico's general purpose computer systems are made in the U.S., as are 20% of its minicomputers.

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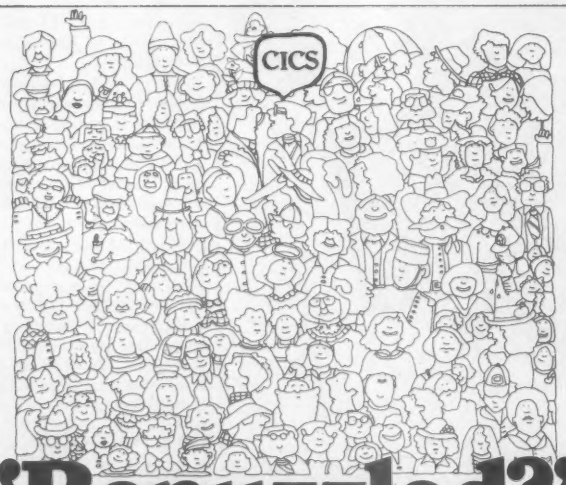

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Insci Writes Applications To Fit Cullinane IDMS

NEW YORK — On-line personnel and payroll applications systems utilizing Cullinane Database Systems Inc.'s IDMS data base management system were announced here recently through a joint agreement between Cullinane and Information Science, Inc. (Insci).

The agreement between the companies licenses Insci to integrate and sell the IDMS system as part of its on-line human resource software.

Slated for availability in the second quarter of 1982, the interactive personnel/payroll systems can be used separately or together by Insci customers, the company said.

According to Insci President Leo Kornfeld, these systems will also be made available as software packages in the fourth quarter of 1982.

The agreement also permits Cullinane IDMS users to add Insci's personnel/payroll packages to their systems at reduced prices. In addition, an interface between the two packages and Cullinane's General Ledger system will be developed.

Prices for the systems range from $40,000 to $60,000 each, for first-time users. More information can be obtained from Cullinane Database Systems, Inc., 400 Blue Hill Drive, Westwood, Mass. 02090.

Rapidata Offering Language For Structured Data Bases

FAIRFIELD, N.J. — Rapidata, Inc., a remote access computer services company, is offering an interactive language for querying and updating structured data bases.

Xplor reportedly combines advanced management techniques, an easy-to-use nonprocedural language and user-oriented "help" features to make data stored in large complex structured data bases more accessible to the end user.

With the system, users are said to have continual access to their data on an ad hoc basis for querying, reporting and updating. It does not matter whether the data is stored in a custom-designed DBMS-10 data base or one created using either Xplor or Probe, Rapidata's statistical analysis and reporting language, a spokeswoman said.

Xplor's nonprocedural language uses concise English-like commands. In many instances, only one command is required to screen, manipulate, sort and report data.

Xplor is compatible with all of Rapidata's computer services. Like the firm's other software, the system's cost to the user is based on standard computer usage rates. Rapidata is located at 20 New Dutch Lane, Fairfield, N.J. 07006.

Applicon Adds CAD/CAM Tool

BURLINGTON, Mass. — Applicon, Inc. has introduced a computer-aided design and manufacturing (CAD/CAM) software package that provides integrated circuit designers with schematic entry and connectivity extraction capabilities.

Designer Logic, said to be the first CAD/CAM package of its kind, is designed to extend the abilities of the firm's VLSI design system to include schematic documentation. The software includes a user-friendly interface, operating commands and component libraries and formatable outputs to logic simulators, a spokeswoman said.

By using the package, designers reportedly do not have to make changes to schematic drawings manually. The geometry of a design is entered into the interactive graphics system using the software's operating commands and component libraries and can later access the information in the systems data base to add or delete geometry.

The connectivity extraction capability of the package allows the VLSI designer to automatically extract a connectivity list of all schematic information using commands that access the data base, the spokeswoman noted.

The Designer Logic software costs $15,000 and will be available in February from the firm at 32 Second Ave., Burlington, Mass. 01803.

Cobol System Runs on TI

ROUND ROCK, Texas — Ryan-McFarland, Inc. has announced that its COS990 multiuser Cobol system will be available on Texas Instruments, Inc.'s Business System 200 computer, scheduled for delivery in April.

Any existing COS990 application running on TI's Models 771 through 30 can be moved to TI's new hardware without change, because the language is source compatible with TI's RM/Cobol, the vendor said.

The price of the development system running on TI's 200 hardware is $3,500, which includes software support for the system running on any other TI hardware, the vendor noted. The package will be available in the first quarter.

Ryan-McFarland is headquartered at 2111 N. Mays, Round Rock, Texas 78664.

IBM System/23 Gets Oil, Gas Accounting

WICHITA, Kan. — Wichita Software Corp. has announced an oil and gas accounting package for the IBM System/23.

Oil & Gas-23 includes accounts payable, accounts receivable, payroll, general ledger, joint-interest billing, revenue distribution and lease management.

Each module costs $1,270 from the firm at Suite 210, 505 S. Broadway, Wichita, Kan. 67202.

Today it's the computer-on-a-chip. Tomorrow? Noted Univac futurist Earl Joseph sees a not-too-distant future when hundreds of millions of components will be integrated on a single, uncut wafer — creating 'component institutions,' the office-on-a-wafer . . .

Artificially intelligent systems will put all knowledge in any subject area literally at our fingertips. And startling advances in recombinant DNA technology will let us create living bio-chips and 'grow' computer and memory molecules. We are on the brink of . . .

A Knowledge-Based Era

HUMAN CAPABILITIES ARE EXtremely limited when unaided by technology. In the past, mechanistic technological advances amplified human abilities for pounding, locomotion, lifting, toting, cutting, seeing, digging, hearing, resisting diseases, coping with weather, performing arithmetic operations and much more.

We are now at a technological threshold — entering a new era for amplifying perception, reasoning, decision-making, inventing, creating, thinking and other mental activities.

This new era results from our recent acquisition of knowledge for constructing artificially intelligent expert machines. Such machines are designed to imitate the brain's reasoning and other powers with the goal of raising the productivity of the mind.

Recent advances in expert systems are putting society at the brink of massive application of artificial intelligence (AI). We are entering a knowledge-based future society.

AI Expert Systems

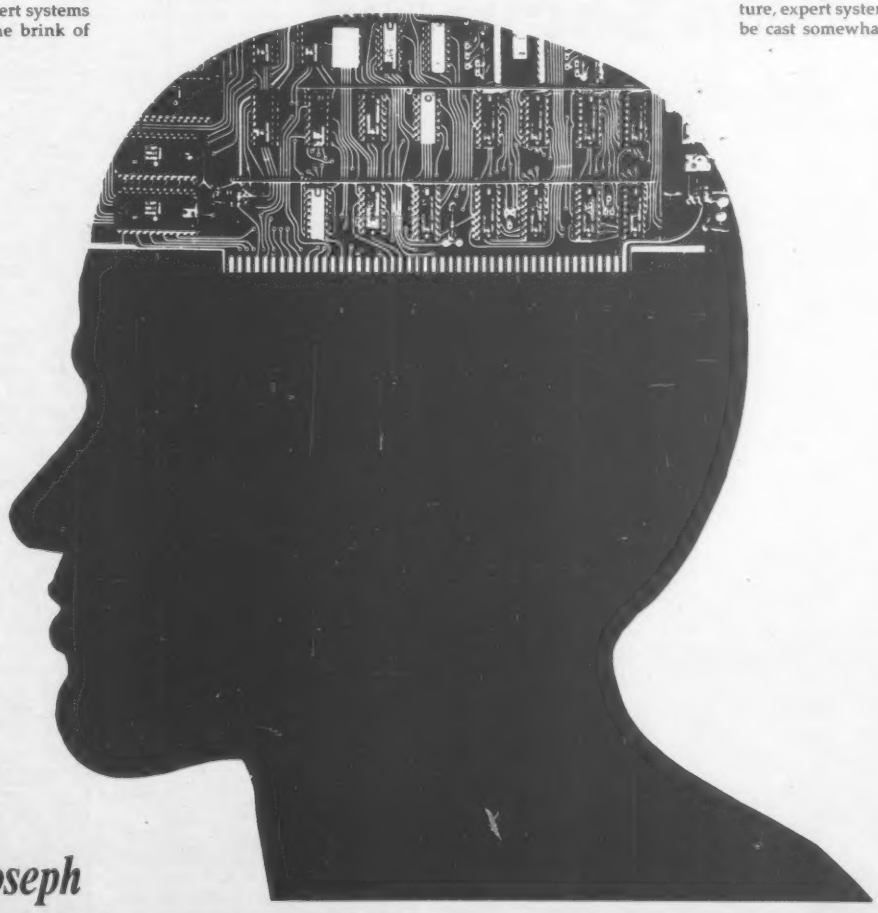
Until now, computers have been well-known for their ability to speed up and take the routine drudgery out of mathematical calculations. Now they are beginning to do likewise for logical inference (see "Prologue to AI" on In Depth/3). The difference is that we will need to be satisfied, in many cases, with "opinionated electrical assistance" rather than absolute facts. Working within this unavoidable limitation, researchers are beginning to formalize the "electronic adviser" for future people-amplifier appliances and tools.

Such electronic advisers are known as "expert systems." They consist of knowledge bases containing data, information, expert knowledge and logical reasoning processes (heuristics). The reasoning processes are imitations of human processes for learning, deductive logic, inferences, discovery and the like — that is, "artificial (with respect to humans') intelligence" processes.

Within 10 years, electronic "advisers," as simple and convenient to use as the modern electronic calculator, could be a part of our everyday dress. They could answer questions and explain the process they used to reach their conclusions, opinions or recommended courses of action (that is, they could backtrack through information, knowledge and heuristics the system used). In the process, such systems behave in general like an electronic equivalent of a professional adviser — often by asking questions.

Knowledge bases are produced from extensive study of human experts by systematically extracting and programming such expert knowledge into expert computer systems. Such expert knowledge is much more than facts and rules. It includes less tangible and less codifiable factors — like opinions and judgments (based upon logical reasoning), educated guesses, as well as factual information and well-formulatable logic rules for reasoning. That is, knowledge-based expert systems contain a simulation of human experts in the form of reasoning processes.

The expert systems that have been developed so far need large computers. In the near future, expert systems could become available for microcomputers. In the remote future, expert systems most likely will be cast somewhat like the modern



By Earl Joseph

IN DEPTH

hand-held calculator and/or will be embedded within other machines.

Imagine, you or I could be amplified with such hand-held expert advisers so that we could perform like expert professionals in just about any field. Such machines fall into the category of "ethnotronic people-amplifier appliances."

Future Growth Industry

Many futurists say these breakthroughs in the field of artificial intelligence will emerge in the 1980s and become a huge growth industry in the 1990s, changing society toward a knowledge-based age. That is, as more of us become amplified with electronic expert systems, so each of us can draw upon society's amassed knowledge. Then we will have the knowledge and ability to participate in the creation of a more desirable society.

Humans very rarely are aware of or use systematic procedures in their own thinking and reasoning. For this reason, it is very difficult to build knowledge bases. But once a reasonable base is electronically stored, it can grow as we learn more and as we gain more insights into what experts use in whatever their field happens to be.

Further, since humans also do their thinking in a "heuristic" fashion, which is difficult for us to know explicitly, electronic expert systems with heuristic logic also could help us with heuristic thinking and inference methods. Some of these heuristics can later evolve toward an explicit logical process as new knowledge is gained.

However, there will always exist, as we have learned from Kurt Godel and others, some knowledge that must remain fuzzy. Some general system researchers are providing theorems for handling such heuristic fuzzy knowledge areas with their invented "fuzzy logic" — which also can be cast into electronic expert systems.

Therefore, whether the knowledge is explicit, logical, heuristic or fuzzy, future electronic expert systems could provide assistance for each of us to perform functions that now require human experts. Further, they will allow us, in the real-time of what we will be doing, to draw upon society's latest knowledge in each expert area we need.

Imagine how the total society's abilities will be amplified when each of us is amplified electronically with such future expert systems!

Inevitable Gaps

Of course, gaps will widen between those who use expert systems and those who do not — until expert systems are in more-or-less widespread use. When will electronic expert systems be in massive use, available at low cost to most everyone? At the present rate of research and development, a good guess would be the mid -'90s, or even sooner.

Artificial intelligence is rapidly advancing beyond academia into practical use by management and most other areas of business and society. The forecast for future AI expert systems includes a number of expanding application areas, such as the aforementioned advice-giving systems. Expert systems are in use today for medical diagnosis, problem solving, architectural design, design of very large-scale integrated silicon circuits, molecular genetic design, office management decision-making, factory management and household advice.

Fundamental Definition

But what really makes up an expert system? Expert systems today are artificially intelligent computer program systems that have a stored knowledge base in their memories, together with interference and other heuristic procedures. AI research investigates the imitation of human processes within computer systems, such as learning, reasoning, inductive discovery, deductive analysis and other reasoning processes including machine representation of knowledge for use in inference tasks.

Heuristics goes beyond the use of standard procedural-oriented strings of instructions operating on streams of data that occur in standard computer program execution. Simply, AI heuristics imitates the human brain, especially processes for discovering

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Prologue to AI

The information age has been in the making for more than 2,000 years, with attempts by scientists to automate the use and production of knowledge. Euclid's geometric axioms are an early example of a step toward automating the process.

Much later, in 1677, Gottfried Wilhelm Leibniz put forward the beginning of an idea for a "calculus of reasoning." He dreamed of such a calculus for reasoning processes in all inquiries including grammar, mathematics, physiology, politics, theology, philosophy and all the arts of discovery. He over-optimistically felt that a few special people could arrive at such a calculus with only a few years' effort. In fact, it was more than 200 years later before Gottlob Frege (and others) advanced formal logic to the point where it seemingly would be adequate for all reasoning in (just) pure mathematics.

Bertrand Russell discovered that Frege's system was inconsistent and suffered from a serious pitfall in that it allowed mathematicians to prove false results as well as true ones. Many, including George Boole, Russell and Alfred North Whitehead, devised logical reasoning systems which, at first, appeared to avoid such fatal flaws. In the 1920s, the mathematician David Hilbert tried to prove that these systems enabled them to prove the whole truth of mathematics, and nothing but the truth.

Then came Kurt Godel, Alan Turing and others in the 1930s who showed that these attempts at achieving a calculus of reasoning were doomed to failure — that such systems were impossible, either for machines or humans. They proved that there could not exist any logical system whose proofs could be checked mechanically and which were both complete and consistent — even for a small fragment of mathematics, let alone the other fields of logic inquiry.

This does not mean that humans have powers of reasoning that machines could never possess. It implies that neither machines nor humans can have an automatic process for proving logical statements.

Thus, it seems that as artificial intelligence becomes an ingredient in machines and robots, they will, like humans, give us educated "opinions," in some instances, rather than absolute truths. At least this will often be the case when "reasoning" is involved and when their actions involve discourse. Of course, they can be designed and programmed to imitate human heuristic methods of proof and reasoning, even if mechanically automatic methods of proof will never exist.

Important Insights

The mathematicians Boole (Boolean algebra), Charles Babbage (difference engine computer), Turing (computable theory) and John von Neumann (stored program computer concept) all provided major insights leading to our present-day computers for mechanically/electronically carrying out logical and mathematical processes. As a result, J. Presper Eckert and John W. Mauchly were able to construct the first commercially available digital computer, Univac 1, in 1951. Serious attempts at imitating human intelligence processes were well along the way at the midpoint of this century. Early breakthroughs were made by von Neumann, Herbert A. Simon, Allen Newell, J.C. Shaw and many others. This work led much later to AI programs capable of proving correctness (within certain bounds) of equations and some problem statements (programs). Thus, we now clearly understand that it would be impossible to fulfill Leibniz's dream — even for the limited case of mathematics. However, more important, it has been shown that the computer could prove correctness, under certain conditions, if such a proof exists.

Recently, in the last decade, considerable progress has been made in devising programs that make inferences from knowledge bases. Outstanding in this area is the work of Prof. Ed Feigenbaum and his graduate students at Stanford University, the AI work by Prof. Marvin Minski at MIT and many others.

how to solve a problem or to diagnose a problem. Thus, heuristics can be assumed to be the process experts use in whatever it is they do.

AI heuristics include inference procedures that allow semantic access of knowledge from knowledge bases.

Knowledge in an AI expert system, once captured from the study of many human experts, could one day allow a layman to apply such expertise and nearly match, and often exceed, the average expert in that field.

Further, AI expert systems can be constantly updated as society gains new knowledge. Expert systems thread through their knowledge bases via "IF-THEN-AND" heuristic rules.

Other Uses

Other applications, besides consulting expert systems, include the arts. Some additional near-term uses and markets involve robotics, assessment and planning, forecasting, intelli-

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gent agent functions and much more.

What, more precisely, are knowledge bases? First of all, they are electronic memory systems that include data base functions. Second, the contents (knowledge) are key. The process of building a knowledge base for use with an AI expert system requires the compilation of an extremely factual taxonomy of each specialized field — and the heuristics for its application.

Knowledge-based taxonomies are more accurate, and therefore more useful, than today's manuals and textbooks. Building knowledge bases requires "knowledge engineering" and knowledge engineers. The basic task in the creation of knowledge bases is closely related to programming, but it uses IF-THEN-AND rules instead of program instructions. After the engineer has found out what experts do, such expertise needs to be coded into the IF-THEN-AND algorithms.

There should be little doubt that as AI systems evolve to become "experts," we will possess very powerful ethnotronic tools to assist us in almost any task we tackle. In fact, because a knowledge base arranges knowledge in a somewhat procedural fashion, such as a computer program, it becomes 10 to 1,000 times more complete, correct and comprehensible than the typical textbook or manual. Experience with current expert systems shows that knowledge-based expert systems will eventually supersede texts and manuals, creating a large new industry for the recodification and application of knowledge.

Beyond Silicon Chips

Today, and for the relatively long-range future, silicon chip semiconductor technology is expected to continue to grow in use and expand into a wider range of applications. But what comes after silicon chip technology, further in the future, for the principal hardware of computers and expert systems?

The answer to this often-asked question takes us along many avenues that are opening up. They include:

- Gallium-arsenide.
- Sapphire.
- Wafers (instead of chips).
- Biophysical technology.

For the nonsilicon chip technology areas, exemplified by the first two listed above, higher circuit densities and higher performances (in speed and/or reliability) seem possible, thus allowing continuing evolutionary progress. The latter two from the list suggest, however, that step-function revolutionary advances are also possible — and likely.

Today, on a single silicon chip, it is becoming possible to integrate more than 100,000 electronic circuit elements, and soon more than a half-million logic circuits will be integrated using near-submicron geometries. Each circuit consists of approximately two or three transistors (micro logic switches) with about four resistors and four capacitors — all made in the silicon by embedding other impurities together with layers of evaporated metal and resistant materials.

Such complexity of circuits

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per silicon chip allows us to design and cast complete machines onto a single component. As evolutionary advances occur, we will be able to integrate larger and larger machines (in terms of capability) onto the silicon. Such "chip machines" or "component machines" become building blocks for bigger machines. For example, the advent in late 1971 of the "calculator chip" made possible the modern hand-held calculator, which has since evolved into the more complex models now in common use.

The small silicon chips are made by breaking up large silicon wafers 3 to 6 inches in diameter. Wafers are sliced from pure silicon crystals grown (manufactured) in silicon foundries from sand.

It is expected that before the end of this decade, we could be using the full wafer as the component — instead of breaking it up into little chips. Today, chip components are necessary in order to separate and toss out the bad chips (bad areas of the wafer). As our semiconductor manufacturing technology further matures, allowing purer silicon with few imperfections, it will become increasingly unnecessary to break the wafer into chips.

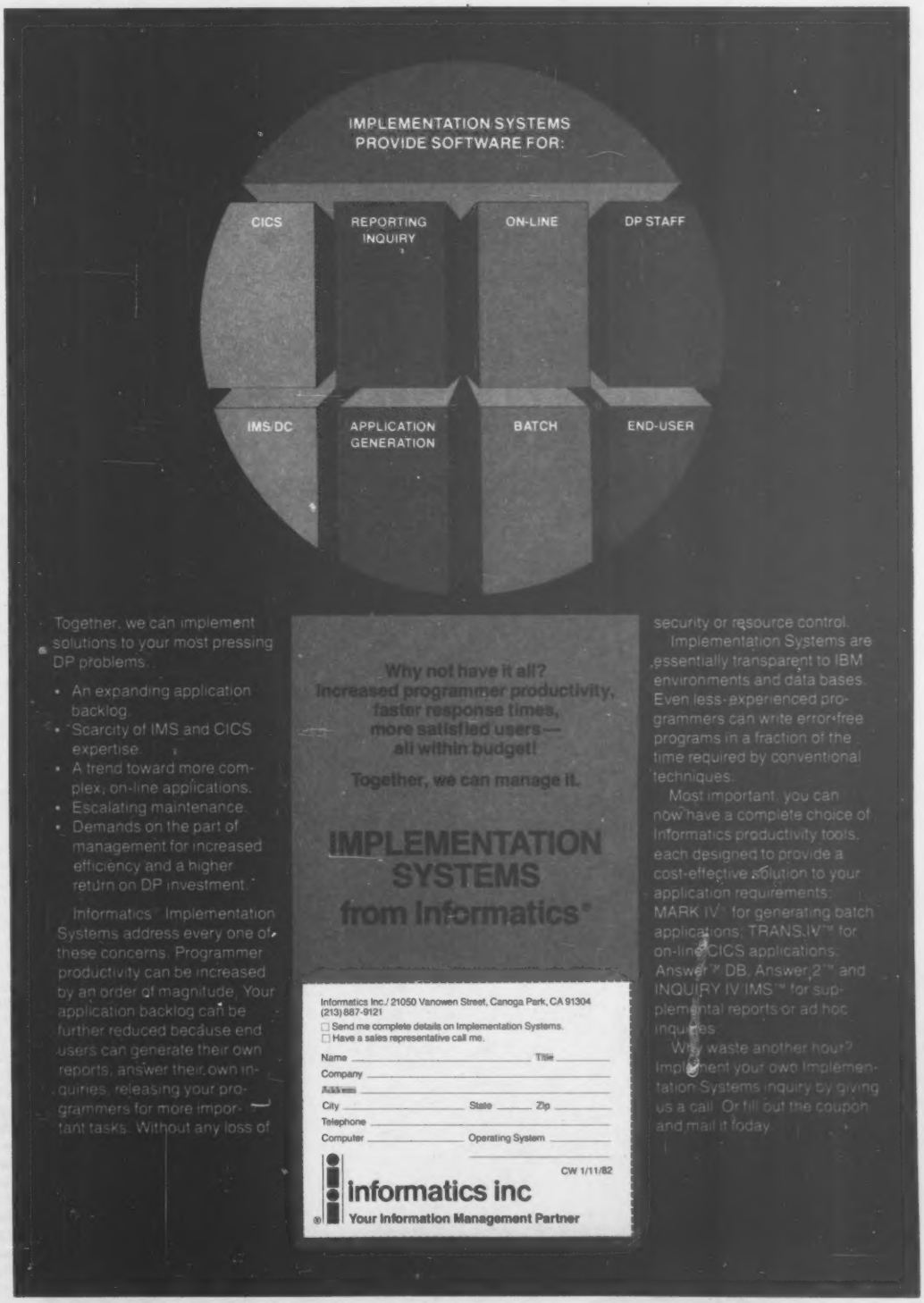
As we begin to use larger portions of wafers, and later complete wafers, we will be able to integrate onto the larger components many millions of circuits — perhaps hundreds of millions. When we reach such a period, in the late '80s or early '90s, we will approach the ability to construct "component institutions." Some possibilities are component libraries, offices-on-a-wafer, component schools and so on.

In other words, we will be able to design, construct and manufacture component institutions as basic building blocks to integrate with component machines for making bigger, more capable and more intelligent machines. In the next decade, we could be designing and using superintelligent expert systems.

Next Step

But what comes after wafer technology? One possible next step in microminiaturization, beyond submicron geometries, could be VSD (very small device) technology, using tens of nanometer geometric features. That would be two orders of magnitude, or 100 times, smaller than the silicon circuit element sizes and interconnection line widths currently in use. Smaller geometries for the circuits result in higher densities — and more capability.

There are few materials capable of reaching these ultrasmall circuit geometries. One candidate now being researched as a replacement for silicon is biophysical molecular switch technology. Such bio-molecular switches can act as conductors and semiconductors and therefore can be used like computer logic-switching circuits. One way these bio-switches operate is through the use of electron-transporting enzymes in electroactive polymers in living systems. Thus, a possible future is to move forward toward bio-chips.



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Since enzymes are living things, controlled by DNA, recombinant-DNA genetic engineering techniques are required for the subassembly process to build bio-circuits. That is, recombinant-DNA cutting, splicing, editing and transcription process technology would be used to design the circuits. The assembly of the switchable organic molecules is accomplished by genetically engineering DNA amino acid sequences to produce specifiable proteins as templates for the self-construction of larger molecules — to grow computer and memory molecules.

So one likely longer range future involves "growing" our future computers as living systems.

For the past two decades (about two-thirds of the history of computers), computers have been forged from silicon-based semiconductor technology. Except for the very early days when relays and vacuum tubes were the principal electronic circuit elements, silicon technology has been the norm for computer hardware.

Silicon technology came into being when we learned how to move electrons in a nonconductor — that is, when we learned to transform glass-like materials into silicon semiconductors by impregnating the silicon with impurities. This led to the invention of the transistor.

Biophysical Electronics

As previously stated, recent scientific investigations point the way for transporting electrons in biophysical materials, specifically via electron transfers in enzymes in electroactive polymers. Thus, a new tomorrow of biophysical electronics is about to dawn.

The accelerating tempo of research into recombinant-DNA genetic technology now suggests that we can edit (redesign) DNA codes to produce different forms of "living" systems. Further, we are learning how to specify (engineer) new, altered DNA genes. Through the use of these design engineering techniques, DNA molecules can also be "commanded" to grow in specific ways, for example, to grow nontraditional living systems like a computer.

But knowledge of the process for transporting electrons within biophysical/chemical systems is not enough. We also need bio-switches. Recent microbiological research with DNA has been successful in pointing the way to synaptic-like bio-molecular switches.

Since electron-transporting enzymes are living systems controllable by DNA, they thus could now become controllable by such bio-molecular circuit switches.

Upcoming Challenge

Therefore, for the long-range future, the newly developing field of genetic bio-engineering could impact computer and expert system developments. Today, with recombinant-DNA splicing and genetic editing techniques, we know how to build the basic building blocks for possible future bio-computers. We have yet

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to learn how to assemble many such bio-circuits and properly interconnect them to form computers. However, we know much about how to start the process.

The basic process is to cut and splice DNA material to cause it to replicate (reproduce) pattern systems like a living computer memory. Future assembly of the switching organic molecular circuits should be possible by causing template DNA amino acid sequences to produce, or grow, specifiable self-constructing DNA collections — that is, to grow a computer or a computer memory by a replication process of multiple cell divisions.

'With DNA we can make electronic circuits a billion times more dense in three-dimensional configurations. That is, the possibility now exists for eventually making computers a billion times more capable and/or for packaging present-day computer capability into an area a billion times smaller.'

We are learning how to design DNA and how to cause DNA to grow to specific design specifications for building new types of living systems. In addition, we can specify them to transfer electrons by growing synaptic junctions like those in our brain. Those junctions act somewhat like transistor computer logic circuits that we now make from silicon.

However, with DNA we can make the electronic circuits, in their linear dimension, about one thousandth of the size of current silicon electronics, that is, a million times smaller in the square dimension — and a billion times more dense in three-dimensional configurations. In other words, the possibility now exists for eventually making computers a billion times more capable and/or for packaging present-day computer capability into an area a billion times smaller!

However, when we cause DNA neurons, with synaptic junctions, to be built through "DNA living" process technology, we find that the gain is much more. With silicon junction semiconductors, we can basically make logic "and-or" amplifiers or memory storage circuits and a few other simple electrical functions. But with neuronal synaptic junctions, we find that DNA processes grow complex logic synaptic circuits capable of threshold functions and much more. For example, the DNA-produced neuron synapse turns out to be a very complex computer-like element rather than a simple "and-or" circuit.

Therefore, as computer genetic sciences advance, we should expect to produce far more capable future computers than would be possible with future silicon electronics.

The process of designing biophysical computers is also very different from that of silicon-based technology. Today for the silicon design process, after a functional specification of the computer has been drawn up, the process continues with a logic design specification. Then after the design is tested, it is manufactured first in the form of masks for making silicon chips. After that, the manufactured silicon chips must be assembled to form the computer, all in a precisely controlled manufacturing environment.

Much of this manufacturing process is repeated for each computer made. Further, each manufactured product must be tested in minute detail at many intermediate stages of the assembly process.

Using bio-manufacturing techniques, the assembly is done automatically, as a DNA-controlled living system process, under precisely controlled laboratory conditions. However, to implement the design requires a lengthy evolutionary process of recombinant-DNA cutting and splicing to produce computer-like functions that can, after many cell generations, achieve the specified design of a computer. Once this stage is reached, however, many altered versions with differing characteristics should be achievable more quickly with simple cutting and splicing.

Many questions arise at this point.

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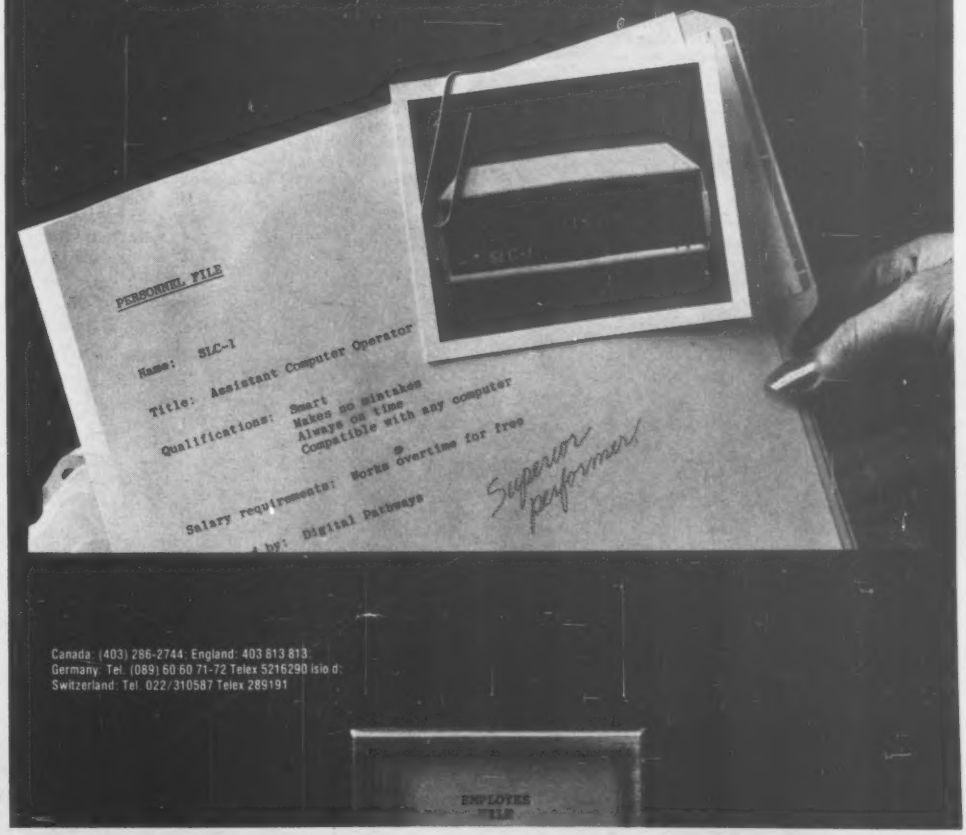

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For example, is the lab gestation period for growing a computer a few days, weeks, months or years? Once lab "birth" occurs, is the future bio-computer ready for work? Or must it go through stages of infancy and youth first? If so, how long are those stages?

Or, is the bio-system computer, built via such a living system process, like a chunk of nonliving bio-hardware, but usable as a computer? If it is a living system, is its nutrition supplied by electricity, chemicals or food? Since at one stage or another the bio-computer is a living system, into what species class would it fall? Or would it belong to a new species?

New Niche

Rarely does a niche of new concepts in the vast ecosystem of human minds open up rapidly to practical application. Most often, many decades must pass before the development process is understood well enough for a new idea to reach its potential.

The recombinant-DNA breakthrough may not follow such a pattern. The genetic breakthrough for DNA splicing came to the idea launching pad in the mid-'70s and could reach mid-course guidance toward practical computer application either some time later in the '80s or early in the '90s.

Bio-technology and silicon technology will most likely be wed to achieve synergistically the best of both approaches — and more — in future computers and expert systems.

About the Author

Earl Joseph has been staff futurist at Sperry Univac in St. Paul, Minn., since 1963. He researches the future and advises management at all levels on future technology, design, impact and application, as well as management of future computers, artificial intelligence and alternative futures for Univac and society.

Joseph obtained a degree in mathematics from the University of Minnesota in 1951 and has been at Univac since then — for the past 30 years.

He is a columnist for the Minneapolis Star, *publishing his own weekly section, "Alternative Futures." He has appeared on local and national TV and radio. He is also an advisory editor for the journal* Futurics *and the editor of* Future Trends *and* System Trends.

Joseph holds three computer patents. He is one of the creators of ethnotronic science and a creator of a language to describe alternative futures. In addition, he is the system architect of five major computer systems, has co-authored more than 30 books and has published more than 150 papers.

He is founder, current director and past president of Minnesota Futurists, a chapter of the World Future Society. He holds memberships in the Institute for Electrical and Electronics Engineers, the Association for Computing Machinery, the American Association for the Advancement of Science and the Data Processing Management Association.

Joseph also serves as chairman for Future Systems, president of Anticipatory Sciences, founding president of the Minnesota Society for General Systems Research and chairman of a technology and research special interest group for Minnesota Futurists.

As an adjunct professor at the University of Minnesota, Joseph designs and teaches graduate courses on the future. He is on the instructional staff of Metropolitan State University and was formerly futurist-in-residence at the Science Museum of Minnesota. He has conducted courses on the future at all levels, from kindergarten through college graduate-level, and is a distinguished visiting lecturer for the IEEE Computer Society and the ACM.

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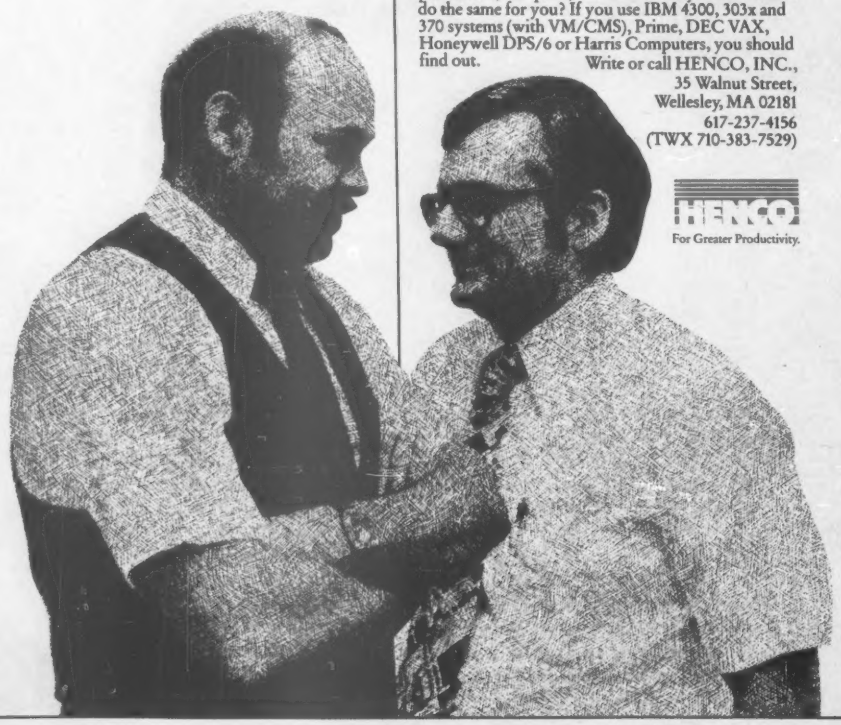

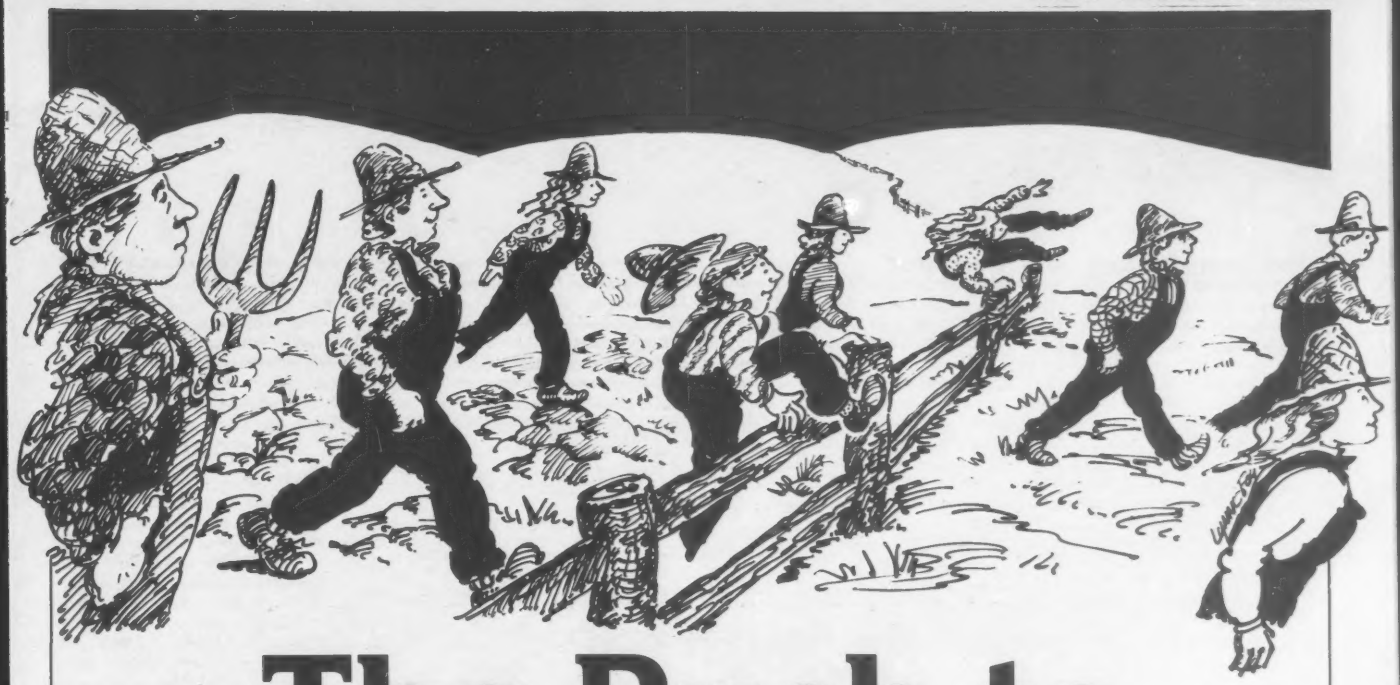

The Rush to Greener Pastures

By Vern Averch

"BE WHERE THE ACTION IS." "We'll give you something to think about." "Come over to the fast lane." "Something better for your career." "You'll like the challenges." These are only a few of the headlines seeking to attract DP personnel in the "Help Wanted" section of a recent *Boston Sunday Globe*. If a job seeker were to take these recruitment ads seriously, he might expect to find the optimum environment in all respects for fulfilling his needs as a DP professional.

But much of what one reads in the recruitment ads is exaggeration at best, as evidenced by the turnover statistics for DP professionals, as well as information developed from exit interviews. In many cases, organizations simply cannot deliver on their promises.

DP pros frequently become a cynical lot with few ties to a specific organization. They develop strong professional ties as a way of both increasing their mobility and lessening the impact of frequent changes in employers. For many in the field, leaving an organization is not difficult since there was little time to establish close, intimate relations with coworkers.

Given the choice, many DP pros would rather work alone on an interesting project than join with others in teams or task forces that could lead to greater coordination, creativity and intimacy. In addition, knowing that their coworkers may soon leave reinforces their tendency to be "loners."

All these factors make the job of motivating and leading the DP professional a formidable task for even a skillful manager. But for the typical DP manager with his less-than-perfect motivational skills, it is nearly impossible to create the utopia described in recruitment ads.

Adding to the problem are the pressures brought about by the organizational structure in which most DP managers and their staffs must work. The typical structure emphasizes control, specialization of function, compartmentalization of operating units and a status hierarchy that keeps people aware of their relative importance in the organization.

The DP professional looking for the "big picture" in his work is often frustrated by the way the organization requires him to work. If he seeks freedom and challenge in his job, he is often met with a supervisor who emphasizes control and has a poor feel for the human relations aspects of the job.

At a recent seminar at Harvard University designed for DP managers and supervisors and sponsored by the Harvard Laboratory for Computer Graphics, I presented a case study for consideration. Its subject was a previously highly productive DP professional with several years of service in his organization who, for the previous six months, had been facing a serious domestic crisis that had thrown him for a loop. His productivity had declined and he was missing work fairly regularly.

The employee's supervisor had refrained from involving himself, since the employee had said the problem would straighten out. However, since it had not, the time for involvement was at hand. The task of the group was to discuss possible useful solutions.

Like a tidal wave came the consensus: "Fire the ingrate." "Get rid of the troublemaker." "Tell him to shape up or ship out." Out of a group of some 20 managers, not one was able to leave his anger for a moment and see things from the employee's viewpoint. His weakness had triggered something so basic, so unacceptable, that it was not to be tolerated.

To their credit, these managers were attending a seminar designed to teach human relations skills. However, as an indication of the compassion that supervisors bestow upon the DP professional, their response to the case study was not a good omen.

In this same Harvard seminar, an instrument designed to measure interpersonal needs is also used. The Firo-B,[1] as the instrument is designated, measures the manager's needs in the areas of inclusion, control and affection or closeness. The instrument measures how much of these needs is both expressed to others and how much the individual wants others to express each type of behavior toward him.

After this instrument had been used numerous times, a pattern became clear. DP managers and supervisors rank low in both expressed inclusion (trying to involve employees in their activities) and in wanting to be included by others. Their need to control others' behavior is in the moderate range. The need to be controlled or directed by others is quite low. In the final scale, which measures affection, closeness with others and intimacy, DP managers scored low on the ability to express closeness to others. At the same time, the score on wanting others to come across to them as close and intimate is considerably higher.

On the whole, the picture is of an individual whose interpersonal comfort level is relatively low. Translating this into the way DP professionals would be supervised by these managers, there would be little effort spent on developing team or family feel-

ings in the department, group activities would be minimized, meetings would at best be tolerated and there would be a reward structure emphasizing independence and self-reliance.

The questions then arise, is this style of management consistent with the needs and desires of the DP professional? Will this leadership style bring forth the best efforts of the DP pro and develop a core of loyal, hard-working and creative employees? Yes and no.

The hook in this analysis is that with respect to his dealings with others, the DP professional is like his boss, but he has even less need to relate to others and often prefers isolated and independent tasks. The manager who minimizes contact with this type of employee is probably ensuring that while he is in the employ of the company (which probably won't be very long), he will be a competent and productive employee.

On the other hand, that employee's identification with the goals of the larger organization will be minimal; synergy and creative effort dependent on others will be the exception. The DP manager faces a dilemma: In order to sustain and develop creative, team-oriented employees and minimize turnover, he must lead in ways that are not always consistent with the immediate desires of the employee group. That is, by developing trust and intimacy and a shared purpose, managers can short-circuit the isolationist tendencies of many of their employees.

That this approach is not manipulative can be seen again in the need of the DP professional for closeness and affection from others even when he has difficulty expressing this need himself.

Japanese Perspective

In Japan, industry has been able to develop this team spirit through promoting trust, intimacy and shared purpose. In his excellent new work, *Theory Z*,[2] William Ouchi describes the Japanese climate and culture inside business organizations and remarks how this culture has contributed greatly to the success of Japanese business enterprises over the last 30 years. The large Japanese industrial firm offers its employees essentially lifelong employment and they are not terminated for other than very serious offenses.

Clearly, in Japanese firms, the response to the troubled individual in the previously cited case study would not have been termination, but support. Arrangements would have been made to pick up the slack until the employee solved his personal problems. In Japanese business, evaluation of performance is not as constant as in American firms. Taking a long-run approach to their business, Japanese firms are willing to forego the need for immediate short-run performance and develop long-term competence in their employees. In addition, mobility between departments is emphasized so that a DP manager might at some point be transferred to the personnel department and vice versa.

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Ouchi relates the Japanese experience to the American business firm through his elaboration of Theory Z, which takes the best of the Japanese system and shows how some progressive American firms have translated these ideas into their own unique operating procedures. The Theory Z U.S. firm is characterized by emphasis on long-term as opposed to short-term goals and perspectives, a holistic concern for people and a structure where problems are discussed and solved at the source and status differentiations are kept to a minimum. Trust and closeness of people are encouraged and developed by the promotion, transfer and communications system.

Shift in Emphasis

The emphasis in these firms in on *development* rather than on immediate results. Clearly, the establishment of this type of organizational climate changes the motivational system from one that is directed from outside the individual. The system becomes inner-directed and fueled by the goals and desires of the individual to contribute his maximum toward positive outcomes for the organization.

This subtle and involving type of organization can minimize the need for the leadership "tools" thought so necessary for controlling employees who were considered to be at odds with the purposes of the organization.

Thus, in DP, a movement toward a Theory Z organizational structure would slow down turnover, give DP employees and managers a broader view of the organization, minimize destructive competition over scarce resources and involve the DP professional in the outcome of the total organization and not just his small segment of it.

The previous discussion makes it clear that for the emerging group of DP professionals, the traditional schemes of organization and motivation will not do the job. It will not be enough merely to pay higher and higher salaries and then expect not only reasonable performance, but creative involvement in the organization.

Some Alternatives

Study after study has shown that higher earnings are not the primary component in DP professionals' job expectations. Interesting work, advancement opportunities, participation in decisions that affect their work and a sense of personal challenge are all seen as the critical components of the ideal DP job.[3] The traditional organization with little to offer in the way of an inspired organizational culture will fall back on trying to keep its work force intact through increasing financial rewards. That this does not work is evident again in the dramatic turnover of DP professionals.

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away from giving DP professionals just a sense that they are involved or a vague feeling that they are participating in decision making. It is time to involve people actively in the goals of the organization, have them share control and decision making and allow each employee a real stake in the organization's goals.

DP managers who have learned the gimmicks of management must now learn what it means to be authentic with their work force, to be able to develop a sense of intimacy and shared purpose and, perhaps most important, to be willing to understand that controlling DP professionals in the traditional sense will only lead to increased alienation and employee turnover.

Rather than going to "how-to" seminars or classes on some set of techniques that will offer the key to motivating employees, managers would be better served attending training where the emphasis is on developing a Theory Z-type organizational culture and the interpersonal skills necessary to install and continue a growth-oriented climate for employees.

Organizations with new technologies and new operating procedures are in a unique position to explore new organizational climates as well. Wedding new and explosive technological advances to old and outmoded organizational forms is self-defeating. The painful lessons of the U.S. auto industry are testimony to the absolute necessity to respond in new ways, both technically and in the human resource area, if organizations are to remain competitive and continue to grow and prosper.

The DP professional and manager have an opportunity to be in the forefront of this move toward a more responsive, more *human* organizational environment. When the goals of the employee and the goals of the organization are in harmony, we will see a full blossoming of DP creativity and productivity. Hopefully, this meshing of goals will someday eliminate the DP manager's constant lament that he needs better techniques to motivate his work force.

NOTES

1. Schultz, W.C. *Firo: A Three-Dimensional Theory of Interpersonal Behavior*. New York: Holt, Rinehart and Winston, 1958.

2. Ouchi, William. *Theory Z*. Reading, Mass.: Addison, Wesley, 1981.

3. For an interesting appraisal of employee attitudes toward a number of work and nonwork-related concerns, see Daniel Yankelovich, "New Rules in American Life," *Psychology Today*, Vol. 15, No. 4 (April 1981), pp. 35-91.

About the Author

Vern Averch consults in management and organizational development in the Boston area. His specialty is planning, designing and implementing programs to improve communications, employee job satisfaction and productivity.

Averch has conducted in-house seminars in effective employee relations practices for managers in a variety of organizations. He conducts seminars in leadership and management of DP professionals for Harvard University and has published several articles on organizational development issues.

Averch holds a B.A. in sociology from the University of Colorado and an M.A. in industrial relations from the University of Minnesota. He has also completed postgraduate training in group dynamics at the National Training Laboratories and has studied clinical counseling at the Gestalt Therapy Institute of Cleveland.

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ALL-DIRECTIONS COMMUNICATION

By Roy Lindsay

Typical upward and downward communication lines within an organization are insufficient when it comes to developing data processing systems. All-directions communication is needed to provide a framework for smooth information flow.

Leo Cherne was quoted in the *Christian Science Monitor* as saying, "The computer is incredibly fast, accurate and stupid. Man is unbelievably slow, inaccurate and brilliant. The marriage of the two is a force beyond calculation."

To realize the potential of this force, there must be error-free communication between man and the computer and, most important, between individuals themselves. Faulty communication is perhaps the single most influential factor in the breakdown of an information system.

Poor communication produces today's "bit-bucket" approach to DP, where there is a constant breakdown between senders and receivers: management, users, project leaders, programmers and operations personnel. At Lawrence Livermore National Laboratory, we have identified four functions that often contribute to broken communications: systems analysis, documentation, user/DP interaction and company management.

Systems Analysis. Haphazard systems analysis can create many types of problems. With no structure to the analysis of a user's needs, sometimes the symptom is fixed, but the problem remains unsolved. In some cases, the wrong people are asked to solve the problem. These situations can lead to project cost overruns, delays or even total failures. A system may be so inadequate that it is not worth the effort to fix or keep running.

Systems Documentation. An ill-defined system cannot be built correctly. With inadequate documentation, an organization does not know what it has or how it works. We have all heard of and seen examples of the programmer who retains only sketchy documentation about how a particular software system works. Much of the essential information is only in his head, and people go to this programmer as if to a guru to solve any problems that arise. If that programmer leaves the organization, who can solve the problems? Who can maintain that system? Who really knows what is going on? This situation can develop with the most critical of systems.

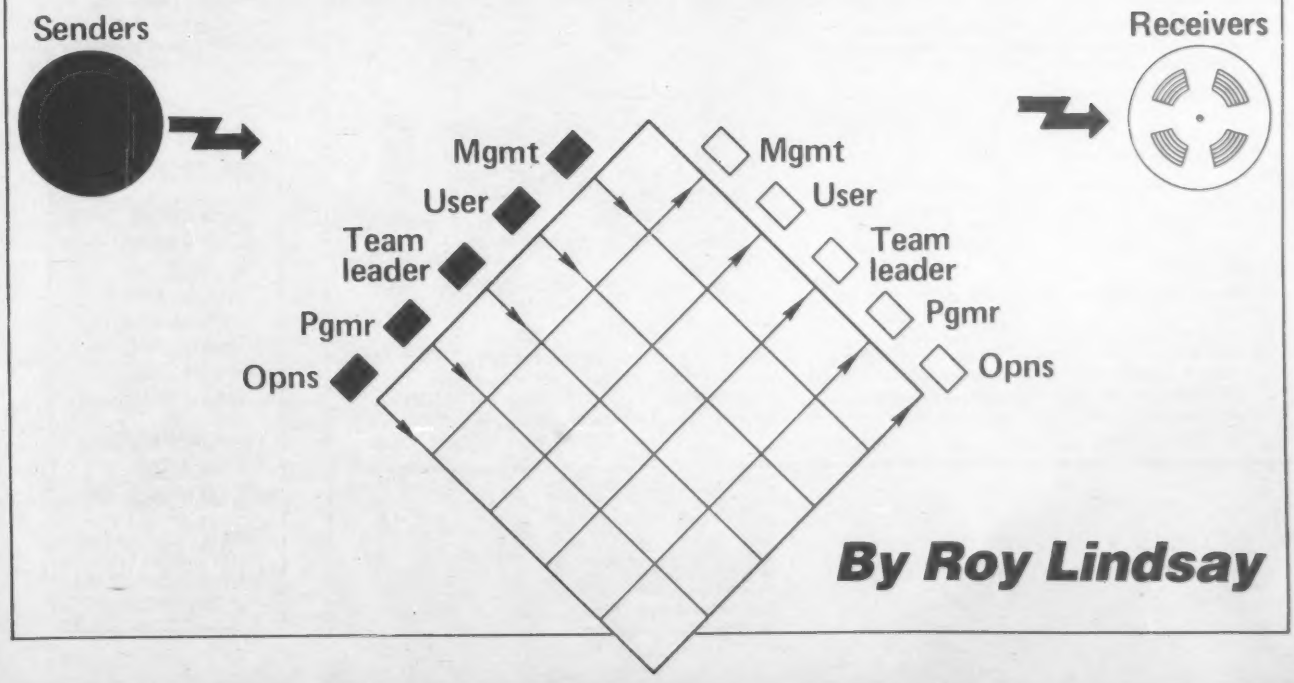
The usual complaints about documentation are that it is insufficient, the wrong kind and almost never up-to-date, but the documentation is all a site has to describe its system. The documentation provides a description of how that system was developed and put into operation. Through that documentation, the DP department finds the ways and means to make changes, update and maintain the system. If the documentation is poor, communication breaks down. Programmers must then spend extra time fixing a problem or making modifications. The result: a loss of productivity that is difficult to measure.

User/DP Interaction. The third area for broken communication is poor user/DP interaction, which often leads to misunderstanding and confusion.

A classic example is that of a user who comes to the DP department and says, "I want XYZ system for my department." DP responds, "Fine. We'll be glad to develop it." Then after hours, weeks or sometimes months of development work, DP comes back to the user and says, "Here's your ABC system." The disappointed, disgruntled user is at a loss to understand why the system is not exactly as he ordered it.

Management Role. A fourth area that harbors broken communication is management itself. Sometimes managers have no clear definition or understanding of data processing. One of the most common problems is that management places the DP department too low in the organizational structure. Another is that management, not realizing the valuable contribution DP makes, may refuse to allocate the necessary resources to make DP a viable, contributing part of the organization.

Management also sometimes imposes unrealistic goals. DP personnel may estimate a project as requiring a year and a half. Management, looking only at the short term, may demand that the system be ready in six months. This situation obviously can create tremendous burdens on a DP department. Let's examine how each of these four areas can contribute to good



all-directions communication and productivity.

Better Communication in Systems Analysis. The recipe for a good system has three ingredients: (1) project control, (2) commitment and (3) a viable, effective and useful development methodology. Effective project control sets and monitors the scheduling of people and resources. It identifies individuals' skills and casts the scope of the project in a realistic timeframe.

Project control should eliminate overstaffing. If a project is behind schedule, it will not necessarily get back on track if more people are added to the work force.

Good project control also provides status updates moment by moment. At our site, we are able to take a view of what is going on at a particular time and identify clearly just how far a project has progressed. Project control also allows us to modify the plan. If we encounter some problems that are causing delays, we can make changes to our plan. We can sometimes modify the project itself so that it can be ready on time. If we know that it is going to be delayed, we can allow other factors influencing the project to be identified and, if necessary, modified.

In systems analysis, commitment means more than involvement. Management must have a deep-seated, broad-ranging commitment. A verbal commitment alone does not carry the necessary weight to impress or inspire a staff. Deep-seated commitment involves a determination to use whatever organizational resources are necessary to bring about the completion of a particular project.

Better communication is achieved when there is a well-defined, predetermined course of action. One such predefined methodology is Atlantic Software, Inc.'s SDM/70, Version 2. This methodology provides the entire organization with preestablished guidelines, goals and milestones for developing a project, so that programmers A and B are not approaching the task differently. The ultimate concern is that all programmers, users and operations personnel be working and thinking within the same framework, using the same terms and approach. This helps tremendously in developing systems quickly.

Good systems analysis does indeed help restore broken communication. With a systems analysis plan that is well-defined, any management level can communicate with all other levels because they have a common ground of understanding. And users who may be involved in the same computer system can understand each other's needs.

Better Documentation. Documentation is one of the most important vehicles of communication in data processing. It is a link between the future and the past. With good documentation, programmers who were not involved in the initial design and development of a system can become familiar with the system in a reasonable period of time. Good documentation helps the programmer understand what needs to be done in order to maintain or correct a system problem. In addition, the system can be more easily enhanced.

Since documentation is so valuable, it should not be scattered among different programmers or placed in sev-

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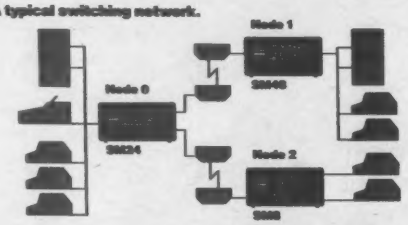

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eral locations. Even if the company's size requires distributed documentation, a central library of current documentation is certainly valuable.

Documentation should be well-organized and easily identifiable. It should be available to everyone in the programming and operations departments and to the user community, if needed. But it must be adequately controlled so that changes to the system are properly placed in the documentation and no changes are left undocumented. Undocumented changes to a computer program or system can jeopardize the system's long-range maintainability.

In the documentation library, it is helpful to make material readily identifiable according to each type of system component. Color coding of the binders (blue for programs, red for system documentation and green for operations guides, for example) can improve accessibility of information.

Documentation should not only provide a written history of the system, but also information on how the system interfaces or interacts with other systems. It is sometimes necessary to read through several binders to find out how a particular data set or file is used in various systems. As an additional enhancement of the documentation scheme, an on-line data base can be set up, summarizing the hard-copy documentation.

The data base may be kept on cards or in a more up-to-date management information system. It could contain data regarding programs, job streams, reports, files, tapes, report recipients, system names, teams responsible, analysts responsible and the user department that has primary responsibility. All this information lets the DP department quickly retrieve information necessary for updating, maintaining or analyzing a problem in a particular program or job. At Lawrence Livermore Laboratories, this data base has become a valuable tool.

Documentation does not have to be a barrier. Good documentation provides the means for all levels of the organization to understand what it has, how things work, how the various systems interface with each other and how the programmers are involved in maintaining, updating and enhancing the various systems.

Better User/DP Interaction. Users and DP personnel should share the developmental responsibilities for a new system. The user may not understand the fine technical aspects of DP, while DP personnel may not understand the fine technical aspects of the user's area of expertise, but by working together, they can produce good systems.

If both DP and the user have well-defined roles in the development process and these roles involve specific duties, problem-solving is easier. On the other hand, if these roles and duties are not clearly defined, more problems are created as others are solved. Good organizational structure and a willingness to work together leads to good communication, and the resulting solution satisfies the requirements: The system works.

'Documentation does not have to be a barrier. Good documentation provides the means for all levels of the organization to understand what it has, how things work, how the various systems interface with each other and how the programmers are involved in maintaining, updating and enhancing the various systems.'

Educating Management. The last barrier to good communication rests with management itself. With improved hardware technology, computers today are capable of doing more jobs increasingly fast. Programming technology has also improved, but not as fast as hardware technology. Management needs to be aware of this increased capability and take advantage of it. Further, manage-

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Here's what Mr. Harvey Cohen, Director of Management Services at American Pharmaseal, who's been in the data processing business for seventeen years, had to say . . .

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"The B 5900 is an entry level system in a class of systems that ranges up through the largest machines that Burroughs makes, all of which have the same software and the same operating environment. So once people get on to the B5900, they may replace processors, they may upgrade systems, they may add components —but the operating environment will remain the same all the way up the line. So once you have made it, it is the last conversion."

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"I am not an electronics expert, but the internal hardware architecture of the system appears to be a major advance in technology. I was told that the B5900 is the first computer with the Burroughs multi-level Function Processor architecture, an internal structure of computers within computers. That's one of the reasons why the productivity is higher while the physical size and power consumption are smaller."

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ment should encourage the DP staff to acquire technical information and allow the use of modern techniques.

Finally, management should give data processing authority and stature within the organization. DP should be placed at a level from which it can most effectively communicate with all the associated departments in the organization. DP needs to resolve differences and demands on system capability and should be placed accordingly. If the DP function is placed too low on the organizational ladder, it suffers from political infighting and misuse.

Management also needs to allocate needed resources — people as well as hardware and software.

The demands on DP are increasing every day. In many cases, it is unrealistic to expect that a large jump in capability and demand can be satisfied by keeping the same number of people or making just a small increase in staff. If the organization is going to step up its demands upon DP for better, more up-to-date systems and for a wider range of capability, then management also must recognize the need to supply the means to fulfill those demands. Unrealistic goals tend to demoralize personnel and detract from productivity.

Communication Tools

Management needs to provide the means for all levels of the organization to communicate with each other. There must be a way for departments and individuals to communicate effectively with upper levels of the organization. Most important, management must provide a method for individuals on the same level to give and take ideas and information. Periodic get-togethers, such as informal meetings, technical sessions and committees, should be encouraged by management so that all levels of the organization participate in developing the system.

Another type of communication tool is the technical manual. All levels of the organization should contribute and work together in preparing the manual. This means that guidelines and rules for standards and procedures for DP are not imposed, but rather are agreed upon.

When there is a need for a quicker way to send out information, a newsletter works well. People from all levels of the organization should be encouraged to contribute items to the technical newsletter. Of course, obviously inaccurate or worthless entries would be screened out, but those that do have value should be published.

Often there is an immediate need to have information available to programmers, operators and even users. This can take the form of a "news flash," either on computer terminals or through postings on bulletin boards.

Community Property

With good communication, productivity increases, participation increases and viable alternatives are more easily recognized. A good system is not personal property, but the result of a group effort.

All-directions communication functions as a matrix, with all levels of the organization serving both as senders and receivers of information. This differs from the traditional top-down, bottom-up type of communication. When all aspects of the organization are allowed to participate in the development and operation of computer systems, productivity increases, with more effective utilization of resources.

This kind of communication may not come easily. It takes effort, planning and, most of all, dedication. However, any organization can benefit from it. The bottom line is greater profitability.

About the Author

Roy Lindsay is technical support group supervisor, data processing services, at the Lawrence Livermore National Laboratory, Livermore, Calif.

He was previously self-employed for six years in the areas of consulting, sales and motivation. Prior to that he was budget manager for the First Church of Christ, Scientist, and served seven years as aircraft commander for the U.S. Air Force, Boston.

Lindsay received his B.A. at Oberlin College, Ohio, and pursued graduate courses in computer science at the University of California-Davis.

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UNIX

By Rebecca Anne Thomas and Jean Yates

A 'user-friendly' introduction to the UNIX operating system, with a special section on the automated office and step-by-step examples of how to use the system.

A COMPUTER IS NOT A SINGLE ENTITY, BUT AN INTERRELATED system of hardware devices and software programs. The traffic director that keeps these components running together smoothly is the operating system program. Today, the UNIX system is one of the most powerful operating systems available for mainframes, minicomputers and microcomputers.

Bell Laboratories scientists designed the UNIX system to be changed. They did not develop it for a single research project or a specific computer or as a commercial product. The system emerged from 10 years of testing and development as a machine-independent operating system with the potential for broad applications in educational, industrial and commercial environments.

The UNIX operating system directs the computer components' activities, simultaneously manages multiple users, allows those users to perform several tasks at once and manages the system's files without user participation or supervision. The simple interaction between users and the system, the system's versatility and its elegant design explain the increasing popularity of the UNIX system.

The capabilities of the UNIX system can overwhelm beginners, but an individual can learn to use it with little previous computer experience. If you are considering using the UNIX system, this article may help you evaluate it for your specific application.

Role of Bell Laboratories

American Bell Telephone Co. was organized in 1880, and Bell Laboratories was established shortly thereafter. Owned jointly by Western Electric Co. and AT&T, Bell Laboratories is one of the largest research groups in the world. It employs more than 23,000 people, owns patents on more than 18,000 products and puts together thousands of technical publications and

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IN DEPTH

seminars each year. More than 60 scientific and engineering awards, including seven Nobel Prizes, have gone to Bell Laboratories scientists.

Bell Laboratories serves several functions in the Bell System. As a basic research organization, it investigates scientific fields relevant to communications, including mathematics and the physical sciences. It also designs and develops products and provides systems engineering. All of the Bell System's facilities, as well as many independent telephone companies, use the UNIX system internally.

In 1969, the Murray Hill Computer Center of Bell Laboratories used a General Electric Co. 645 mainframe with the Multics operating system. Multics was one of the first multiuser interactive operating systems.

Before Multics, only batch-oriented operating systems were available. Instead of providing an almost immediate response to a typed-in command, these systems required an intermediary process. To convey data or to request information from the computer, you first "typed" coded punch cards, which were subsequently processed by the computer in large batches. Several minutes to several hours later, you received the printed results confirming your entry or fulfilling your request. This method was too slow for programmers who needed an immediate response from the system.

Although interactive, Multics still lacked capabilities that were essential to programmers. It retained certain batch-mode characteristics that once preserved the privacy and security of each user's data, but now served to isolate the programmer's work. In 1969, Ken Thompson originated an operating system that would support coordinated teams of programmers during product development and would simplify the work of human and machine, thus making computers more accessible to beginners and programmers alike. The result, the UNIX system, was not written all at once. It evolved — and continues to evolve — in response to the programming requirements of specific projects.

Development of the System

One such project was a program Thompson developed called Space Travel. It simulated the movement of the major celestial bodies in the solar system. Finding the cost of single-user interaction with a mainframe to be prohibitive, Thompson rewrote Space Travel for a lower cost minicomputer, a Digital Equipment Corp. PDP-7.

Minicomputers were the first systems inexpensive enough for a single university department or small company and small enough for single-user interaction. However, there was no software available for the PDP-7; it did not have the memory capability to store the source program for continuous development. Programs had to be written with the GE mainframe, then compiled and then stored on paper tape. The object program on paper tape was then loaded to run on the PDP-7.

While it was less expensive to run Space Travel on the minicomputer, any program changes had to be written on the GE 645 before execution by the PDP-7. Continuous loading of the paper tape was a slow and vulnerable process. To both write and run programs on the minicomputer required developing the necessary software. Thompson wrote an operating system, a PDP-7 assembler and several utility programs, all in assembly language specific to the PDP-7. The operating system was christened the UNIX system, a reference to the unified, team-programming environment it would serve.

Evolution of C Language

An operating system based on assembly language is machine-dependent. The program runs on one particular type or brand of computer and cannot be easily transported to a different system. For this reason, Thompson developed a transportable language, B. The B language was modified by Dennis Ritchie, who developed the C language and then rewrote UNIX software in C. The UNIX system, based on Multics and written in assembly language for the PDP-7, was now rewritten in C and could be moved to virtually any com-

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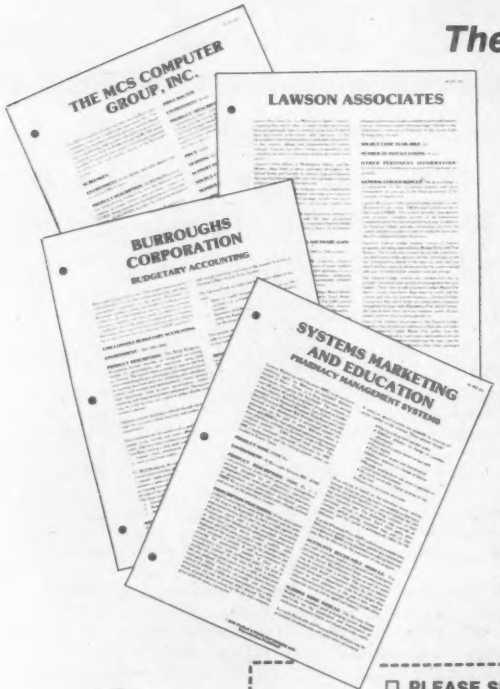

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puter.

C has been used by software developers to write utility, operating system and application programs for research and business uses. UNIX software includes many C programs. Some are incorporated as new system commands for users or system managers, while others perform specific functions in the system. For example, one program updates a data base describing the condition of industrial machinery, while another provides text-editing functions. University professors and students have incorporated numerous C programs in UNIX software. Consequently, Western Electric sells licenses for the UNIX system with approximately 200 C programs.

With the increasing power and decreasing cost of minicomputers, the UNIX operating system rapidly became popular. These machines were used to control laboratory experiments, support machine-aided design, supervise telecommunications networks and perform business functions. Developing software to fulfill these specific applications presented programmers with a new challenge, and the UNIX system offered tools to meet it. By 1978, more than 800 UNIX system installations were running in universities, government facilities and the Bell System.

UNIX System Programs

The UNIX system programs are functionally categorized as follows:

- The *kernel* schedules tasks and manages data storage.
- The *shell* is a program that connects and interprets the commands typed by a system user. It interprets user requests, calls programs from memory and executes them one at a time or in a series called a "pipe."
- *Utility programs* perform a variety of routine and special system maintenance functions.

The UNIX system can be supplemented or modified by anyone who has access to the source code. A large community of programmers has enhanced the system, including individuals with the University of California at Berkeley, Harvard University and the Rand Corp. The UNIX system now includes Berkeley's "vi" and "ex" text editors, and other programs are being commercially developed, including an engineering calculation program developed at California Institute of Technology that performs symbolic as well as numerical mathematics. These new programs will be joined by many more, adding to the library of commercially available UNIX software.

Most operating systems include commands for moving and storing files, programming and maintaining the system. Separately purchased application programs are required for additional functions. The UNIX system utility programs include additional commands to edit text, create spelling dictionaries, imitate a desk calculator, prepare tables and send electronic mail.

Educators, administrators, researchers, managers and program developers adapt and employ UNIX systems

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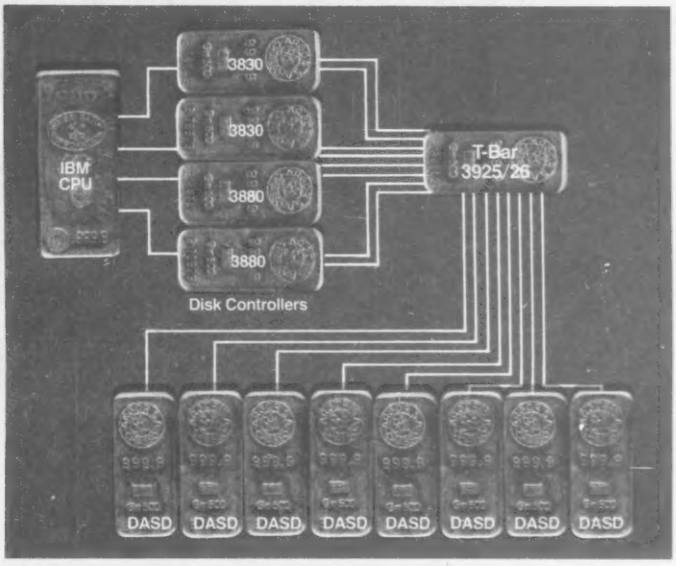

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to fulfill their specific needs, which might include:

- Text preparation and printing.
- Document storage and manipulation.
- Programming.
- Electronic mail.

Text preparation encompasses clerical, editorial and production functions. The UNIX system has equation, table and text preparation software that supports total in-house production of journals and books.

By creating functionally defined directories and invoking commands to manipulate them, the user can create an "electronic filing cabinet" without purchasing additional software.

Since the UNIX system was designed by and for programmers, it offers several program development features. For many applications, programs can be written without a programming language. Users select and link system commands to create specific programs within the shell program, called *shell scripts*.

Electronic mail is an integral part of the UNIX system. A user can send messages to himself, to other users in the same computer system, to users of other computers networked into his computer or, by modem, to computers at distant locations. In many UNIX system installations, daily phone messages, departmental memos, reports and accounting data are sent from person to person via their desktop terminals. These desktop units can be conventional CRT monitors or more powerful microcomputers.

At Universities

The UNIX system is supplied to educational nonprofit organizations at a low cost. Approximately 90% of university computer science departments use the UNIX system, and many advanced programmers and computer science majors learn to use the UNIX system and to program in the C language. It has been improved and continuously modified by several generations of computer science students and professors. Since any software developed under an educationally licensed UNIX system cannot be copyrighted, most of this software remains in the public domain.

In universities, the system runs computers used for teaching and research projects. Programs calculate statistical results of experiments in biology, chemistry, computer science research and other fields. Numerous data bases are developed and maintained on UNIX systems. At the University of California at Berkeley, one data base tracks the cancer-causing properties of common products and correlates it to trends in populations consuming those products.

University administrative offices use UNIX software to speed up office tasks. Letters and papers are typed using the ED command and other text editing programs, and the UNIX system's TROFF typesets many university publications. The system not only bills system users, but also handles the general accounting needs of the university. Throughout campuses accessing UNIX systems, departments develop separate mailing lists and data bases and prepare documents using the system programs.

Research institutions use UNIX systems for many of the same functions universities do. Bell Laboratories designers use the system to accelerate and simplify complex circuit design.

UNIX System Now Runs On These Machines:

- Amdahl 470 (IBM 370)
- Bolt Beranek and Newman, Inc. C50/C70
- Data General Corp. (C compiler)
- Digital Equipment Corp. PDP/11
- DEC PDP/7
- DEC PDP/8
- DEC VAX
- Fortune Systems
- Honeywell, Inc. 6000
- IBM 370 (C compiler)
- IBM 4300 (under development)
- IBM Series/1
- Intel Corp. 8885/8086 (under development — Microsoft/ALT/OS)
- Motorola Corp. 68000 (under development — 40 companies)
- Onyx 8002
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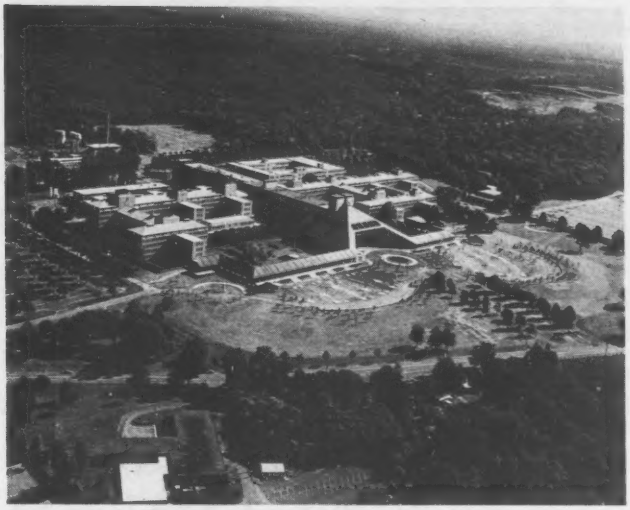

Corporate Headquarters and Basic Research Facilities of Bell Laboratories

Ken Thompson, who helped develop the UNIX system and is a member of the Computing Science Research Center at Bell Labs, runs a program on a UNIX-based PDP-11.

In 1980, Bell Laboratories introduced UNIX Seventh Edition and dramatically decreased the single-user binary license fee. This permitted computer manufacturers to develop UNIX software economically and small businesses to purchase the UNIX system for their personal computers.

Buying UNIX Software

There are two ways to buy UNIX software: source licenses and user or binary licenses. A computer manufacturer that wants to alter the UNIX system for its own product buys an expensive source license from Western Electric. This source license provides the information required to change and rewrite UNIX software. A user, perhaps a small business, will buy a much cheaper binary license from a company that owns a source license. To ensure compatibility, a user will purchase both the computer system and the UNIX system from the same source-licensed company.

The year 1980 marked a major change in the use of the UNIX system. It began to migrate from the academic and research environment of mainframes and minicomputers into the commercial world of microcomputers.

A growing number of companies are working on or have introduced UNIX system products during 1981, and more are anticipated in 1982.

The UNIX system lacks some essential features for business applications. For example, the command names are obscure; GREP, PWD and CAT do not convey a command function. With some commands, it is easy to destroy files, and if you type a space in the wrong place, you can erase everything you have stored in the system.

It often seems as if the system thinks "no news is good news." It prompts you only when you have made a mistake.

Users must remember a lot of commands, so a reference card is essential. The card in common use at Bell Laboratories is 14 pages long. Many users will not need to learn the function of each level of command structure available in the system, yet moving from simple to complex levels is

An engineer uses a computer-controlled wire-wrap machine to build a prototype electrical circuit. An experimental set of UNIX system programs allows him to design the circuit on a graphics CRT terminal and to control the wire-wrap machine.

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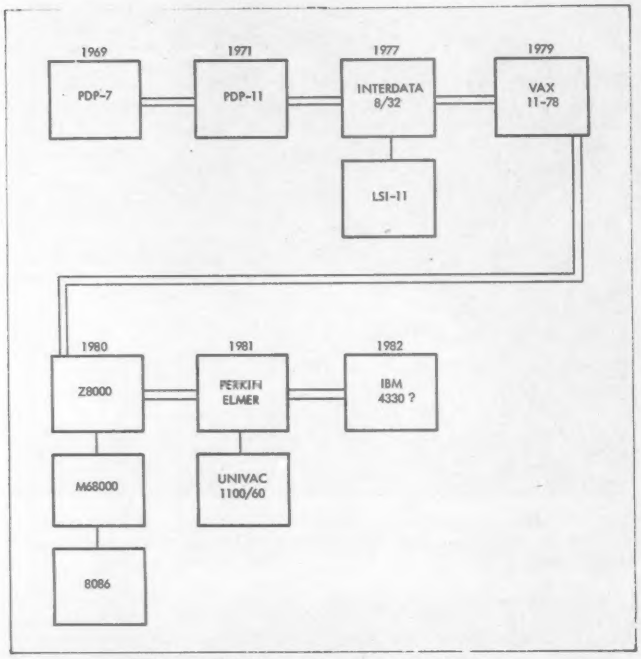

History of UNIX as a Transportable System

a necessary step for all users and is initially quite confusing.

A new version of the UNIX system, UNIX 3.0, will soon be released, and users can expect to see some changes in these areas. Computer manufacturers offering the UNIX system on their systems are adding help features to improve system-user interaction. Many large installations have added prompts and helpful on-screen aids to using the system.

Applications In the Office

The automated office is not simply a room full of machines. It is an environment in which employees use interconnected electronic equipment to perform the organization's administrative, managerial and analytical functions.

The change to automated offices is evolutionary; most businesses will use a building-block approach to introduce new office automation equipment as they determine what functions are best automated. Automated office equipment must fit functionally, organizationally, physically and economically into an existing office organization.

There are many reasons for automating an office. Typically, a company that changes from typewriters to word processing can more than double productivity. However, producing paperwork faster and in greater quantities is not necessarily better, and forcing

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Invitational Computer Conferences

What Makes Up

Electronic Mail

A standard definition of electronic mail is still under development, but it is generally considered to be the electronic delivery of messages that would otherwise be transmitted through the postal system or local interoffice mail facilities. Interest in electronic mail is stimulated by the inadequacies of the postal services today and the need to increase speed and efficiency in interoffice communications.

Electronic mail provides the speed and convenience of phone calls with the option of retaining a copy of the message. At about 50 cents per message, electronic mail costs more than a postage stamp, but its speed and efficiency make it preferable to traditional mail services in many situations. A large number of firms plan to install electronic mail systems within two years. Electronic mail terminals will be on the desks of employees of these corporations, paving the way for more advanced functions, such as data base manipulation or analysis.

Data Base Management Systems (DBMS)

Data base management systems have traditionally been used by mainframe computer operators to produce rough analytical reports for managers. In the automated office, employees will use machines networked into the mainframe computer, requiring a different DBMS. Few companies have implemented distributed data bases in offices. DBMS continue to be used for writing reports and not for on-line analytical inquiries, which senior executives could do themselves.

DBMS users agree that several characteristics of today's data bases need to be changed. Command languages similar to English must be used to support many people without extensive training in the access and use of a data base. Multitasking, that is, the ability of several people to update and work with the same file at the same time, is crucial in distributed processing. Data security must be maintained, limiting personnel to data appropriate to their functions only.

Data base systems for microcomputers are much simpler than those for mainframes or distributed systems. Most data base programs on 8-bit microcomputers are file managers. More complex 16-bit systems can use relational data bases adapted for them from the minicomputer world. These products will require more installation, and multiuser capabilities will make their file manipulations and access procedures more complex. Connecting these microcomputers — now containing the same relational data base systems as many computers — to other computers will result in the development of new security and protection mechanisms. These mechanisms will allow the minicomputer to control access to its larger data files, while the microcomputer analyzes and performs data entry functions.

Color Graphics And "What-if" Analysis

Color graphics stimulates immediate understanding of material such as financial and sales projections. According to psychological studies, color-coded graphs are not only more aesthetically pleasing than black-and-white graphs, but they can also be perceived more efficiently.

Technological advances have reduced the time needed to perform calculations for "what-if" analysis. Electronic spread sheets are used in many offices. But these "what-if" programs display the data in rows and columns that require further interpretation. The statistical relationships are used to make important decisions that can potentially involve large sums of money. It is important for timely and accurate analysis that data be presented in as clear a fashion as possible.

A major drawback in using business graphs has been the difficulty of implementation. Graphics software has required that users be technically sophisticated, but this is changing. A study by Gnostic Concepts, Inc. documented a high demand for packaged color business graphics programs for micro- or minicomputers. The study found more

new equipment and new procedures to replace established practices can be dangerous. The successful introduction of office automation requires convincing fellow workers of its viability and integrating it into the company with minimal problems.

The implementation of automated office products in large companies will take from seven to 10 years, and high-volume sales of more complex automated office products will not occur until the late '80s. While the office of the future will be filled with an amazing diversity of sophisticated communications, word processing and storage equipment, the systems will still be dependent upon us, the people who use them. We can adapt slowly to change, but an instant, profound change in our office work may affect day-to-day operations significantly for many months or years.

More Hookups

In the office of the future, equipment that once operated independently will be linked in networks. Digital Equipment Corp., Intel Corp. and Xerox Corp. have joined together to develop a local communications network (Ethernet) that will permit equipment from different manufacturers to communicate within the same building. Ethernet uses a coaxial cable similar to that of a cable television. Other companies, including Wang Laboratories, Inc., AT&T, IBM, Datapoint Corp. and Bolt, Beranek and Newman, all have their own concepts. Consequently, a major shakeout will occur in the market while standards are determined.

the Automated Office?

The heart of most large telephone systems is the PBX (private branch exchange). Tomorrow's PBX may well be the center of the modern office, integrating networks of CRT terminals and office equipment where data processing, word processing, electronic mail, facsimile transmission and voice transmission are connected with one cable. Voice/data communications is evolving, allowing voice and data to use telephone wiring simultaneously for communication.

There are four aspects of office automation: administrative automation, data processing, data base administration and telecommunications. These four disciplines must be combined for efficient performance in an integrated office system. Local networks will eventually allow these functions to communicate back and forth.

On a larger scale, future automated offices will operate through networks of PBX or other voice-controlled systems. Workstations, either limited terminals or complete microcomputer systems, will fulfill word processing and data base applications. Facsimile devices will transmit graphic images as well as typed text. Mass storage devices will store an electronic office's records, partially replacing filing cabinets filled with records on paper. The machines will be connected in local networks and tied into larger networks to connect several branches of a corporation or access external information exchanges.

Common Desktop Gear

Soon CRT terminals will become as common as desk telephones. Large companies now use clustered workstations for word processing and data entry. Desktop computers will provide management with access to central data processing functions. No longer estranged from the DP department, management will supplement hard-copy reports by directly accessing data bases, sending electronic mail and running financial modeling programs to support rapid analysis of the company's activities.

As workstations become increasingly popular, new functions will be added. Data entry, once limited to writing or typing, will be supplemented by methods such as voice data entry and optical character recognition (OCR). Most important, the terminals will be connected to local networks of voice and data transmission, shared files and disk storage.

than 80 projects under development that were designed to make color business graphics software easier to use.

Another factor limiting color graphics in management has been the cost of devices that print the color image displayed on the screen. Hard-copy printouts are available in several forms today. Cameras are used to photograph an image on the CRT for transfer into slides or overhead projection foils. Color printers are also available. Currently, hard-copy output of color graphics must be centralized within one relatively expensive printer, but the increasing demand for color graphics reproduction will eventually decrease the price of color graphics printers. Multiple-color ink jet printers may soon be available for as little as $2,000.

Text Processing

More sophisticated word processing systems include enhanced programs to verify accurate spelling and diction and will add paper-handling devices to increase printing speed and facilitate processing. For example, these systems will stuff letters into envelopes and print customized forms. Optical character recognition (OCR) devices will be used to input printed data to a computer. These OCR devices read a printed page of text and convert it into binary data. Voice entry will be used (we will be able to talk to a computer and dictate instructions for editing rather than typing at a keyboard). Very small and inexpensive text processing machines will become available. Liquid crystal displays will be used to decrease cost and size.

Facsimile Devices

Facsimile transmission has been popular for the last few years, but has been limited in application because of its cost. Facsimile transmission involves sending photographs and documents from one "fax" machine to another over conventional telephone lines. The use of facsimile is natural for an office where these functions are routinely needed. Facsimile techniques will also affect the way we design photocopying and printing machines in the future. Eventually, facsimile devices may be included in our desktop workstation unit.

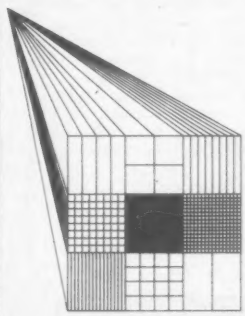
The key to an integrated electronic office is the electronic storage of data. As we have file cabinets full of paper today, we will have mass storage devices full of data in the future. Mass storage costs are decreasing rapidly; Winchester disks and bubble memories will be integral parts of every desktop computer. This data storage will be supplemented at the minicomputer and mainframe levels of local networks. In the most inexpensive configurations, data will be stored on floppy disks. However, with Winchester disks and other storage becoming less expensive, the greater capacity provided will make desktop computers very popular, even in the most basic workstation environment.

Successful Computer Networking

Considered the harbinger of future networks, the Arpanet packet-switching system developed by Bolt Beranek and Newman of Cambridge, Mass., has been installed in several dozen locations and supports thousands of people on dozens of interconnected computers. Electronic mail, a focal point of the system, is used extensively for communications among programmers and office personnel.

The product, Info Mail, was designed to operate with existing computers, terminals and networks. Info Mail simulates a desktop system with "in and out" boxes and includes multilevel filing systems. Other networks also answer the need for connecting different brands and types of computers and terminals together in both local and remote networks.

Two of the largest systems, Tymnet and GTE Telenet, offer electronic mail service in their packet-switched national networks. Tymnet's service, called On Tyme II, will handle different terminal types and models, including teletypewriters. Most of these systems allow each user to have an individual electronic mailbox, which can receive "mail" from any other terminal on the system.



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The UNIX operating system supports office automation. Many conventional operating systems are limited to the CPUs for which they were developed. The UNIX system, however, can be transported easily from office workstations to minicomputers, microcomputers and mainframes and can control typesetting machines and other equipment.

This transportability now introduces competition for computer manufacturers who have historically bound their customers to a single brand of equipment, using proprietary operating systems and communications protocols. The UNIX operating system allows communication among many brands of equipment, which will be an absolute necessity in the automated office of the future, where no single manufacturer will be able to supply all the required hardware and software.

The UNIX system supports a revolution in the way all office personnel interact with computers. It signals a dramatic shift in the role of the software user. The end user learns a single operating system to control multiple operations on multiple machines, from manipulating text files on desktop microcomputers to accessing mainframe computers with huge data bases representing many thousands of records. The same UNIX system commands that perform administrative functions, such as text processing, are used by system administrators and programmers to maintain and enhance the system.

Many UNIX system users are taking advantage of the systems design to add applications and make sophisticated changes. The UNIX system was designed to be easily customized to a particular company's needs. Many of the improvements made in UNIX system installations are incorporated into the operating system at other sites or into new releases by Western Electric.

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Getting a Feel for

Following is a tutorial for new UNIX system users that explains the system's "shell prompt" and walks the user through some basic commands.

The Shell Prompt

Log into your UNIX system. The system may report the last time you logged in, any messages of general interest to users of the system and so forth. Ultimately the cursor appears to the right of the *shell prompt* symbol, which is usually a $ or %. This symbol comes from a program called the UNIX system shell.

The *shell* is a program that aids communication between you and the UNIX operating system. It reads the command lines you type on the keyboard and interprets them as requests to run or execute programs.

The shell finds the program requested by your command, brings it into memory and executes it. The shell searches one or more particular directories to find the command. Normally, after searching your directory, it will try to find the programs in /bin and /usr/bin (two standard directories where programs are located). After exhausting all possible directories, it will display a message and another prompt.

```
command not found
$ □
```

After the command is executed, the prompt appears, indicating that the shell is ready for your next command.

Now type "date<CR>". The letters d, a, t and e are stored in a temporary location by the shell. When you press the carriage return to indicate that the command is complete, the shell will look for the program called date and will direct it to run or *execute*. The result will be displayed immediately and the shell will issue another prompt for your next command.

```
$ date
Wed Sep 2 15:40:30 PDT 1981
$ □
```

You may wish to change your password from time to time in order to prevent unauthorized use of your account. Your new password should be at least four characters long if you use both upper- and lowercase letters and numbers and at least six characters long if it is all lower- or uppercase. The longer the password, the harder it is to guess. You can enter a password up to eight characters long on most systems. You can use any characters but the typing-error correction codes (# or @) in your password.

We will change or define your password now. After the $ prompt, type "passwd" followed by <CR>.

```
$ passwd
Old password: □
```

Now type in your current password. It will not appear on the screen for security reasons. Remember to press <CR> after your password. The system will now ask for the new password.

```
$ passwd
Old password:
New password: □
```

After you type your new password and press <CR>, the system asks you to repeat the entry to minimize the change of a typing error, since you can't see what you typed.

```
$ passwd
Old password:
New password:
Retype new password: □
```

If both new password entries match, the system login password file will be updated to reflect your new password.

Many users of operating systems complain about the clumsy structure of the programs. These systems often contain massive interrelated programs with long histories of fixes and changes. The resulting jumble of commands becomes increasingly difficult to understand and reflects the interdependent impact of modifying the system. In contrast, the UNIX system is a set of small, separate modules, many of which could be deleted from the system without affecting the operation of the others. Therefore, the UNIX system allows you to use only the part needed. The system contains many flexible tools the user can learn to use as needed.

The UNIX operating system today contains the networking and telecommunications software necessary to tie many brands and types of machines. Vendors of equipment related to the Unix system are developing the hardware and software connectors they need to tie into the network.

the UNIX System

Remember your password! You cannot log into the system without it. If you do forget it, you will have to ask the person in charge of your system to delete your old password so that you can log in and reset it.

Who Is on System

To see who is currently logged into the system, use the WHO command. Consider the following responses to the WHO command.

```
$ who
veronica    bx066      Aug 27 13:28
rathomas    dz24       Aug 28 07:42
jlyates     tty5       Aug 28 07:39
$ □
```

The login names appear in the left-hand column, the terminal devices are listed in the next column and the date and time of logging in appears in the last column.

In this tutorial, the output of the WHO utility is sorted by the terminal field.

Type-Ahead Buffer

The system can read your next command while executing the last one. The characters you type at the keyboard are constantly being stored in a system buffer.

If you have a terminal with a slow display rate (1,200 bit/sec or less), then you can illustrate this point by typing in rapid succession "who<CR>" then "date<CR>".

```
$ who
veronica    bx066      Aug 27 13:28
rathomas    dzdata24   Aug 28 07:42
jlyates     tty5       Aug 28 07:39
Wed Sep 2 15:40:30 PDT 1981
$ □
```

To illustrate how the type-ahead buffer functions with a faster terminal, type a command which requires more time to execute and enter date for the second command.

You can send electronic mail to others on the system if you know their login names. The command form is the word "mail," followed by the login name of the addressee, followed by a <CR>. The cursor will be positioned on the next line, waiting for your input.

```
$ mail your-friend
$ □
```

Now you can type your message. Remember to press the carriage return at the end of each line. You can terminate the message by typing either a D or a period as the first and only character on the line, followed immediately by a <CR>.

```
$ mail your-friend
(YOUR MESSAGE)
.
$ □
```

Note: Since it is so easy to type too many D's and log yourself out, consider ending your messages with a period as a general rule.

You can send yourself mail. Mail is a convenient way to leave yourself a reminder. Type "mail," a space, then your own login name (indicated on the screen display by your-name) and end the command line with a <CR>. Then enter the following line: "This is a reminder to myself.<CR>". Type a period, and nothing else, on the next line to end the message.

```
$ mail your-name
This is a reminder to myself.
.
$ □
```

The next time you log in, the system will inform you that "You have mail."

It is often possible to avoid programming completely when developing a new use for the UNIX system. Many times a combination of UNIX commands can do the job. We can combine several commands to handle simple tasks that occur in an office workday using pipes and shell scripts.

In UNIX system installations, general- and special-purpose programs that can convert data from a file or program into a different form are being written in greater and greater numbers. If a new program is necessary, it can be written as a shell procedure instead of a C program. This consists of typing names of commands with specific arguments and requires a minimal investment of time and effort. Therefore, programs that might be used only a few times can be economically developed with existing tools.

UNIX System Tools

One of the greatest powers of the UNIX operating system is its capacity to be customized to accommodate everyone's particular needs. Since the operating system is in separate modules (or tools), the most popular tools are enhanced and strengthened while the weaker procedures die out.

The unique file structure of the UNIX system allows programs, documents, data and so forth to be stored in the file system and to be protected either by the file mechanism or more elaborate software. Much of the drudgery involved in file and program manipulation and maintenance is bypassed. Tools in the system automate many common programming tasks and tie them into single-command sequences. The system minimizes the number of techniques needed to organize and maintain a library of files. This minimal style is one of the aspects most appreciated by users.

The tool aspect of the UNIX system has a wide range of applications. Combinations of existing small and reliable commands in the system can be designed into different structures; the user need not construct larger, unproven ones. The UNIX system helps meet individual needs without requiring programming knowledge or familiarity with producing new software.

Although the UNIX system comes as a set of tools, the system is easily individualized, both within a total installation for a number of users in an office and at separate workstations. Programmers may make changes that affect programs most frequently used

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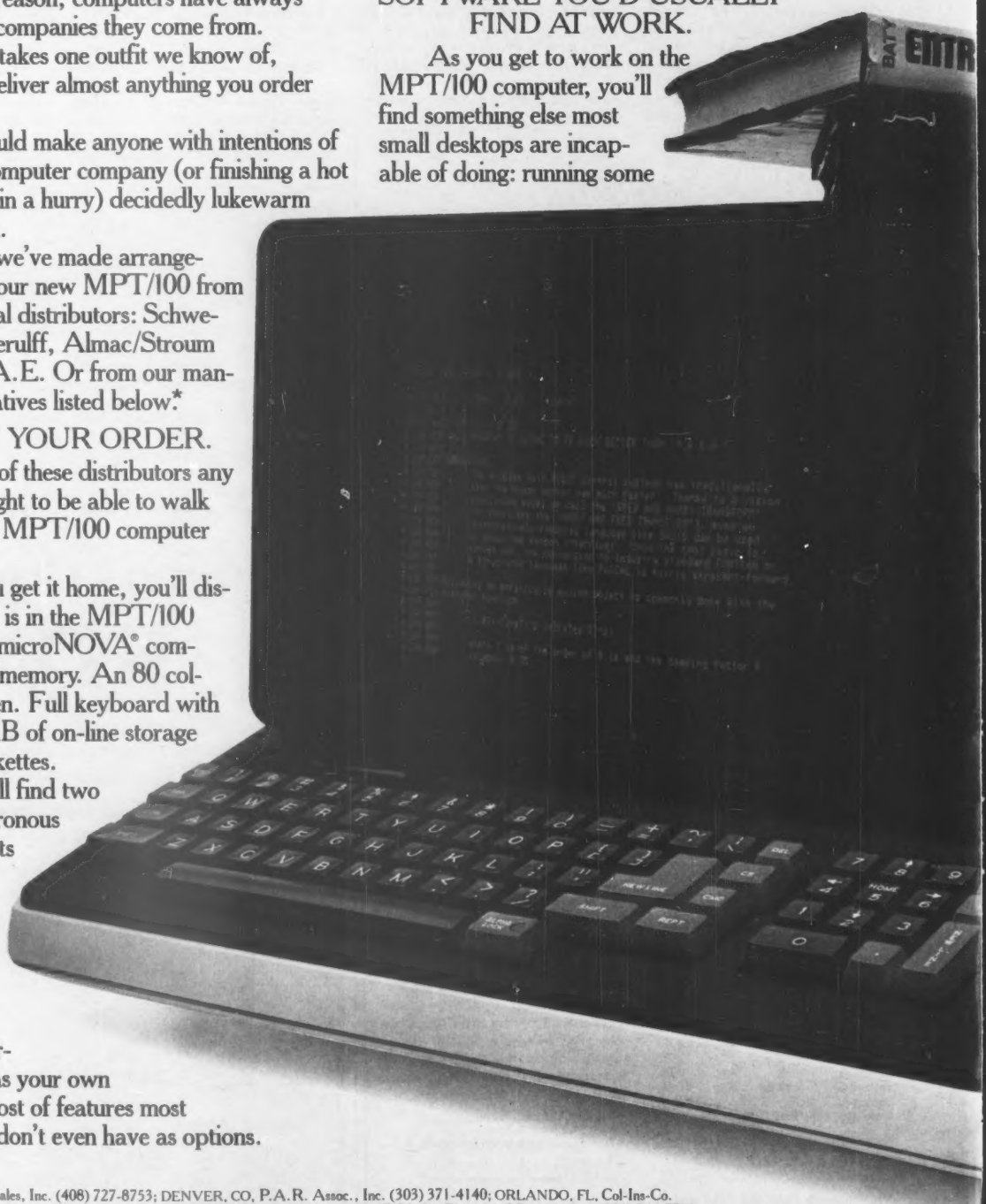

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IN DEPTH

throughout the company. But users can also individually write, shift or change programs they want to use themselves. This chameleon feature of the operating system means that no one is stuck with a system that does not work.

Modular Approach

Many programs (accounting systems in particular) become large and inflexible monsters that cannot be changed and shifted to the changing needs of the office. Unix builds software in modular pieces, any one of which can be removed from the system and rebuilt without causing side effects. By following simple procedures, a system designer can use a computer to produce programs customized to the needs of the office today and be assured that these programs can be easily replaced and upgraded to meet the needs of the office in years to come.

Learning to use the UNIX system in performing office duties gives an end user great power for the relatively few commands typed. Many companies offer programs for the UNIX system that already perform office tasks. However, a user will not implement the powers of the system if he does not use any of the commands himself. If he learns the concepts behind the programming his company buys, he can apply them to packaged software and can customize the system to his needs.

Many tools available on the UNIX system allow nonspecialists to define and process data. Although these tools were originally intended for developing programs, they are very useful in a wide variety of application programs as well. By using tools, an individual can gain access to facilities he does not have to understand in detail. He can construct programs by using available tools and pieces. Typing several commands in succession results in what would otherwise require advanced programming knowledge and a long period of time to produce.

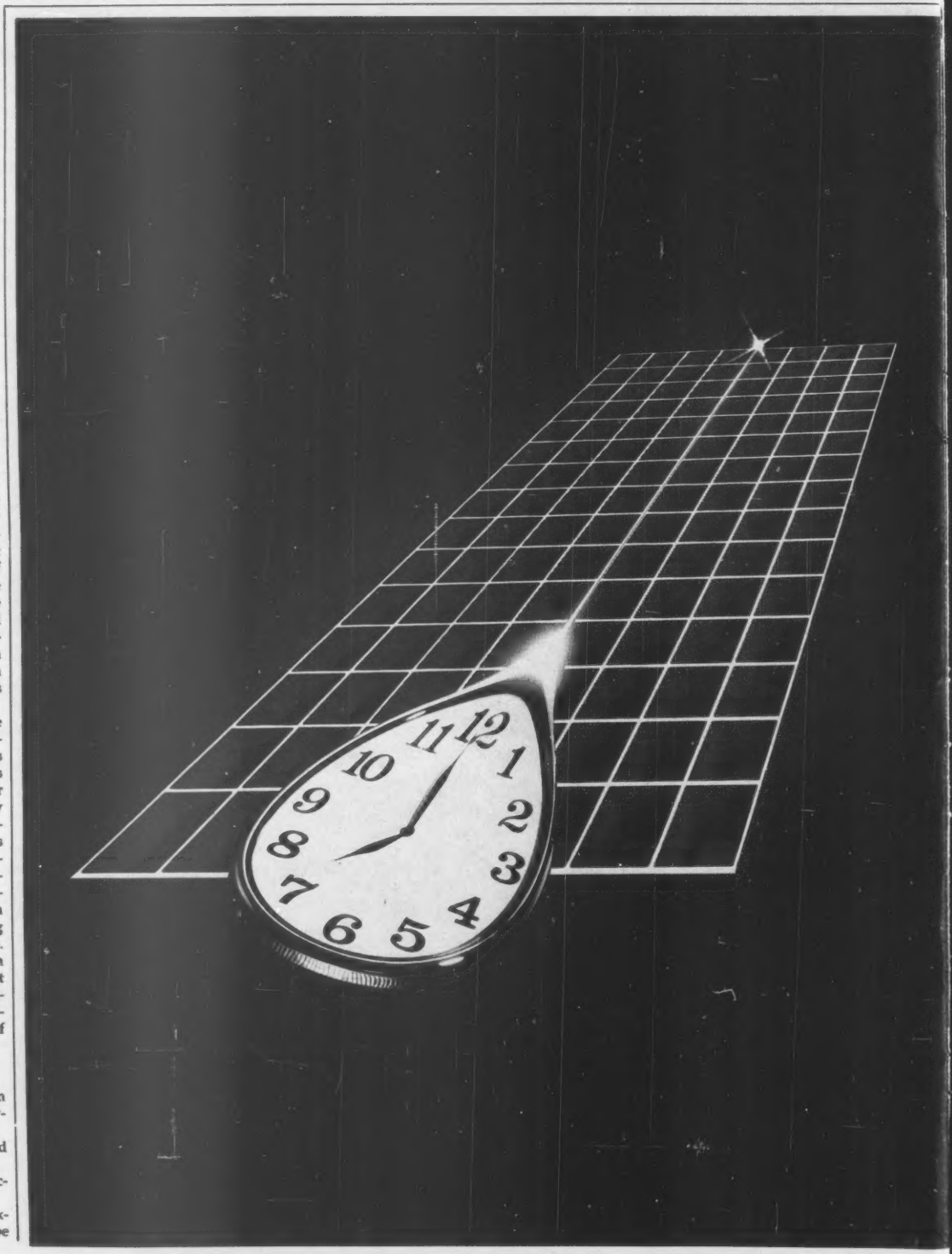
Programming Features

Using the UNIX system tools introduces the following programming features:

- The results are produced quickly.
- Results are likely to function without bugs.
- The program remains flexible and adaptable and can be changed easily without affecting performance.
- The process is usually portable to another machine without any change.
- Programming is naturally modular and therefore easier to maintain.
- Users can access complicated programs without having to understand the details involved.

Since complex tools written in languages unique to the UNIX system are built from simple and single-function components, programmers continue to create new tools to enhance those that exist. This stimulates growth of the system, rather than reinvention or redundancy.

The current UNIX system has evolved through a process not unlike natural selection. The system received by end users is modified immediately to their specific needs.



There are three types of information flow in an organization:

- Operations (the actual production of goods and services).
- Control (the monitoring of operational and administrative activity).
- Administrative (communication of decisions and plans and information relevant to their execution).

Administrative functions, encompassing the creation, control, storage, transmission, recall and delivery of paperwork throughout an organization, can be handled with the UNIX system. Electronic mail can be used to communicate information that previously would have been typed on paper and passed from hand to hand. Processing this information can be greatly speeded up by programs in the operating system that modify, compute, extend or recombine these doucments.

The UNIX operating system has more than the tools to perform these functions. The degree to which people like operating systems and the way in which a computer interacts with them will determine the success of an automated office. The UNIX operating system is ranked highly by many users for its functionality and manageability.

Electronic Mail

Internal company documents are frequently needed within a few hours after generation. Interoffice mail in large corporations takes much longer, as handling through internal mail slows information flow. Messages sent through electronic mail are received sooner and are produced at a much lower cost.

After a computer system has been implemented with desktop workstations for each office worker, electronic mail supersedes hand-carriage of messages and documents. It permits immediate and simultaneous on-line access by a number of people upon transmission.

With the UNIX operating system, a user can talk to another user of the system with the write command, send electronic mail if he is not online, access any computer linked to the system (in some installations there are as many as seven to 10 computers networked into a huge system) and perform many other functions. He can write a letter, send it to be printed on a typesetting unit and send that output automatically to a photocopying machine that makes 500 copies of it. This can all be done from one desk.

The UNIX operating system handles every type of file function. In the typical installation, each user (with individual terminals or workstations) has several hundred personal files within a directory. These files can be docu-

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ments, programs or subdirectories. Different types of information can be categorized and stored within a tree-type directory system. Each person's own directory can be made selectively accessible to other people by changing parts of the personal directory system. This means that you can allow someone else to use the mailing list for which you are responsible, while keeping them out of other records.

When an individual moves out of his own directory and decides to work on a large data base (say, the accounting records of his company), the same techniques and tools used to manage his own files are utilized. The UNIX system commands do not differentiate between large and small files.

Burgeoning Market

Business opportunities and market trends indicate that the market for UNIX system-related hardware, software and services may exceed $9 billion in 1986.

The UNIX system is a unifying factor in the computer industry. The microcomputer, minicomputer and mainframe markets have been relatively separate. However, with the advent of a truly transportable operating system, they will be able to share software and services and will slowly intermingle, particularly with the increasing use of distributed processing.

By 1986, the UNIX system will represent a market rather than a single product. There will be a variety of look-alikes, the UNIX system with improvements and related product concepts. The UNIX system represents a move toward transportability and the availability of a large volume of compatible software that will run on a variety of different brands and types of computer equipment.

Proprietary operating systems become much less desirable when organizations attempt to tie different brands and sizes of equipment into networks for distributed processing. In addition, as an ever-increasing percentage of the work force begins to interact with computers, demand for packaged software for very specific end-user applications will grow. End users, particularly in the microcomputer market, naturally prefer to choose from a variety of software packages available on many brands of machines than to purchase software that ties them to one piece of hardware and limits the number of programs available to them.

The UNIX operating system and the concept of transportability will allow software to straddle different markets. For the first time, it may be possible for the largest software companies to attain annual revenues in excess of $100 million. This can only be accomplished if the software can be moved easily across a wide variety of machines. The UNIX system and UNIX-like operating systems will allow that.

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About the Authors

Rebecca Anne Thomas is co-manager of the UNIX Information Service of Gnostic Concepts, Inc., a Menlo Park, Calif.-based market research firm. She is a freelance programmer and consultant in the areas of 16-bit operating systems and program implementation. Thomas formerly worked for Micropro International, Inc., a microcomputer software company.

The author of articles for the computer trade press, Thomas is a contributing editor to several publications. She is involved in the development of software manuals for 16-bit microcomputer systems and is co-authoring additional titles on the UNIX system for Osborne/McGraw-Hill.

Thomas received her Ph.D. from the University of California at Berkeley.

Jean Yates manages the Microprocessor/Microcomputer Industry Analysis and the UNIX Information Service for Gnostic Concepts. She has also managed custom studies dealing with microcomputers, software, product marketing and acquisitions. She is a contributor to the Electronic Industry Econometric Forecast.

Yates has written for the computer trade press and, prior to joining Gnostic Concepts, was a consultant to computer manufacturers in the areas of software and hardware development and applications. She also has several years of experience in product planning and marketing.

Yates received her B.S. degree from Duke University.

Any Tales Of Terminals?

The upcoming *Computerworld* Special Report on data communications terminals needs your help. We are looking for expert user, vendor and editorial commentary on the way terminals are making computers more responsive to users' needs.

Some of the topics for possible discussion include how to get the most out of dumb terminals, ways to configure networks for multiple applications and guidelines for evaluating terminal equipment of all types. Other subjects that have been addressed in the past are market surveys, point-of-sale terminals and vendor directories. If you have another idea, try it out on us.

The deadline for manuscripts is Feb. 10. Submissions in the form of four to seven pages of typed, double spaced copy should be sent to Bruce Hoard, *Computerworld* Editorial Department, P.O. Box 880, Framingham, Mass. 01701.

Study: No Rush to Board Telecommuting Express

By Phil Hirsch
CW Washington Bureau

Although Alvin Toffler and others have forecast that many of us soon will be working at home and communicating with the office through on-line terminals, a recent study has concluded that if there is an increase in "telecommuting," it will be far more gradual than the pundits predict.

The study was conducted by Associate Prof. Charles G. McClintock of Cornell University. It consisted of in-depth interviews, collected over a year, involving 20 participants. Couples with and without children as well as single persons comprised the group; some of the single persons were also parents. The jobs encompassed by McClintock's study ranged from administrative assistant to management information system manager, but in every case information manipulation was a major job task. Six of the 20 participants were previous telecommuters who had given up working in an "electronic cottage." Including them in the study provided some interesting insights into the disadvantages of the arrangement.

One of the study's key findings is that employees who work at home, even though physically separated from their coworkers, may be able to increase their output of complex, nonroutine work and communicate more effectively. As McClintock explained it, "Telecommuting resulted in an overall increase in the amount of time available for more complex and nonroutine tasks."

Partly, he said, this happened because working at home enabled the employee to avoid contact with other workers. He could turn off his terminal when he did not want to be disturbed, and those who needed computer time could dial in before or after regular working hours.

McClintock also found that telecommuters were able to accomplish more during the hours they spent in their offices. (Each participant spent only part of the working time at home — the range was from one to 30 hours per week.) The office time was "less likely to be interrupted by routine tasks and was therefore felt to be more concentrated and effective," he explained.

The improvement in this area, however, wasn't really due to working at home; rather, it resulted from the fact that each participant was linked to a computer-based electronic mail system that provided a largely automatic way of arranging meetings, distributing announcements, and handling similar routine communication chores, thus making it unnecessary for the employee to devote office time to such matters.

(Continued on Page 62)

Users of Datapoint 'IEOS' Gain Access to Teletype, TWX, Telex

SAN ANTONIO, Texas — Datapoint Corp. has released a controller for its Electronic Message System (EMS) Network. The controller extends the EMS range for users of its Integrated Electronic Office System (IEOS) software to Teletype Corp. stations and TWX and U.S. Telex Corp. networks.

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The network controller can operate independently from IEOS, allowing TWX, Telex and Teletype users the ability to communicate with each other using the same protocol conversion, automatic routing, delivery to multiple addresses and management reporting capabilities inherent in the IEOS-based operation.

The turnkey network controller can support from one to 1,000 addresses (mailstops). Transmission speeds range from 50 to 4,800 bit/sec.

The minimum configuration requires one Datapoint 6000 series Advanced Business Processor with 128K bytes of memory, a disk storage device and a local printer if management reports are desired. Disk storage is required for terminal control, message distribution, traffic routing, path selection, format conversion and transmission cost assignment.

The cost of that configuration is approximately $33,000, Datapoint said from 9725 Datapoint Drive, San Antonio, Texas 78284.

Software Links Datapoint, IBM Machines

NEW YORK — Computer Dynamics, Inc. has announced a Batch Communications Program (BCP) that provides host support for Datapoint Corp. distributed processing systems. The BCP can provide a direct link between an IBM 360, 370, 30 series or 4300 processor and a Datapoint system.

Multitasking and multiline communications are supported, as are up to 225 remote/batch terminals, the vendor said. The package is compatible with Datapoint 1500, 1800, 3800, 6000, 6600, 8800, 1130, 1170, 2200 and 5500 distributed data processing terminals.

A single-line version of the package costs $8,000 and the multitasking version costs $12,000, the firm said from Suite 407, 390 Fifth Ave., New York, N.Y. 10018.

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Enhancement Out For TSO/Tcam

SACRAMENTO, Calif. — A performance enhancement for the IBM TSO/Tcam user is available from Software Module Marketing, Inc.

Quick-Tube is said to establish the Autopoll Channel Program protocol for remote binary synchronous 3270 terminals. By shifting the polling function from Tcam to the 370X or compatible control unit, the enhancement reportedly reduces CPU overhead and improves TSO response time.

Quick-Tube costs $650/mo or $7,800/year for the first CPU from the firm at 1007 Seventh St., Sacramento, Calif. 95814.

From Anderson Jacobson
Coupler Offers Variety of Modes

SAN JOSE, Calif. — Anderson Jacobson, Inc. has unveiled an acoustic coupler that communicates with the Bell 212, Vadic Corp. 3400 communications protocol and Anderson Jacobson 1200 series modems and also in the Bell 103/113 mode.

The AJ 1233 is an originate only, full-duplex acoustic coupler/modem that is switch-selectable at data rates from 0 to 450 bit/sec asynchronously. It may be used in all modes either as an acoustic coupler or modem, directly connected to the switched network by a modular RJ-11C jack.

In the Bell 212 acoustic mode of operation, a digitally synthesized signal is inserted into the transmitted signal through a patented technique that linearizes the response of the carbon microphone in the telephone handset, allowing acoustic coupler connection over telephone lines.

As a low-speed modem (Bell 103 mode), the AJ 1233 allows the operator to communicate with a computer for interactive time-sharing or data entry using the most economical line speed through either dial-up or operator-placed calls.

When computer files are to be read to the local terminal, the 1233 can be used as a medium-speed (1,200 bit/sec) modem, operating in either Bell 212 or VA 3400 mode, saving both connect time at the computer and telephone line charges. It offers the user the advantages of three acoustic coupler/modems in one unit.

The device will be available in March and costs $995, Anderson Jacobson said from 521 Charcot Avenue, San Jose, Calif. 95131.

'Lantex-11' Introduced For PDP-11

PLAYA DEL REY, Calif. — Lantor Information Systems, Inc. has unveiled for Digital Equipment Corp. PDP-11 users a computer-based message and line-switching software system that provides data line concentration, interactive word processing and electronic mail system capabilities in a single package.

Lantex-11 is a modular system that can be adopted to accommodate individual message handling and data communications requirements at various levels of complexity and size. It is designed to operate on PDP-11 computers using the RSX-11M multiuser real-time executive and VT100 CRT terminals.

Each module operates as a completely independent RSX11 M/S task and is transparent to RSX11 and Decnet software.

Lantex-11 costs between $15,000 and $25,000, depending on configuration, Lantor said from 8055 Manchester Ave., Playa del Rey, Calif. 90291.

Telecommuting: Troubles Sighted

(Continued from Page 61)

A major disadvantage of telecommuting, as suggested by the study, is that it creates what McClintock called "potentially stressful effects at home." Among his six nontelecommuters, "the most frequently stated reason" for not working at home was "to avoid any 'spillover' of work-related issues in the home. It seems that telecommuting is not for everyone and if forced on an employee it could have negative consequences for nonwork as well as work domains."

Several other problems were identified by the study group as a whole. For example, each participant's terminal interfaced with a telephone, which tied up the telephone at times when members of the family wanted to make or were expecting calls. Finding an acceptable space for the terminal and related work materials was another source of friction. Also, some workers found that their domestic roles — as parents, wives or husbands — interfered with their jobs to the point where they had trouble working effectively at home.

"These problems could easily eliminate the productivity improvements produced by telecommuting," McClintock said. He believes a key indicator of whether a particular employee can work more productively at home, as opposed to the office, is the "employee's ability to manage conflict in the nonwork domain."

COMMUNICATIONS

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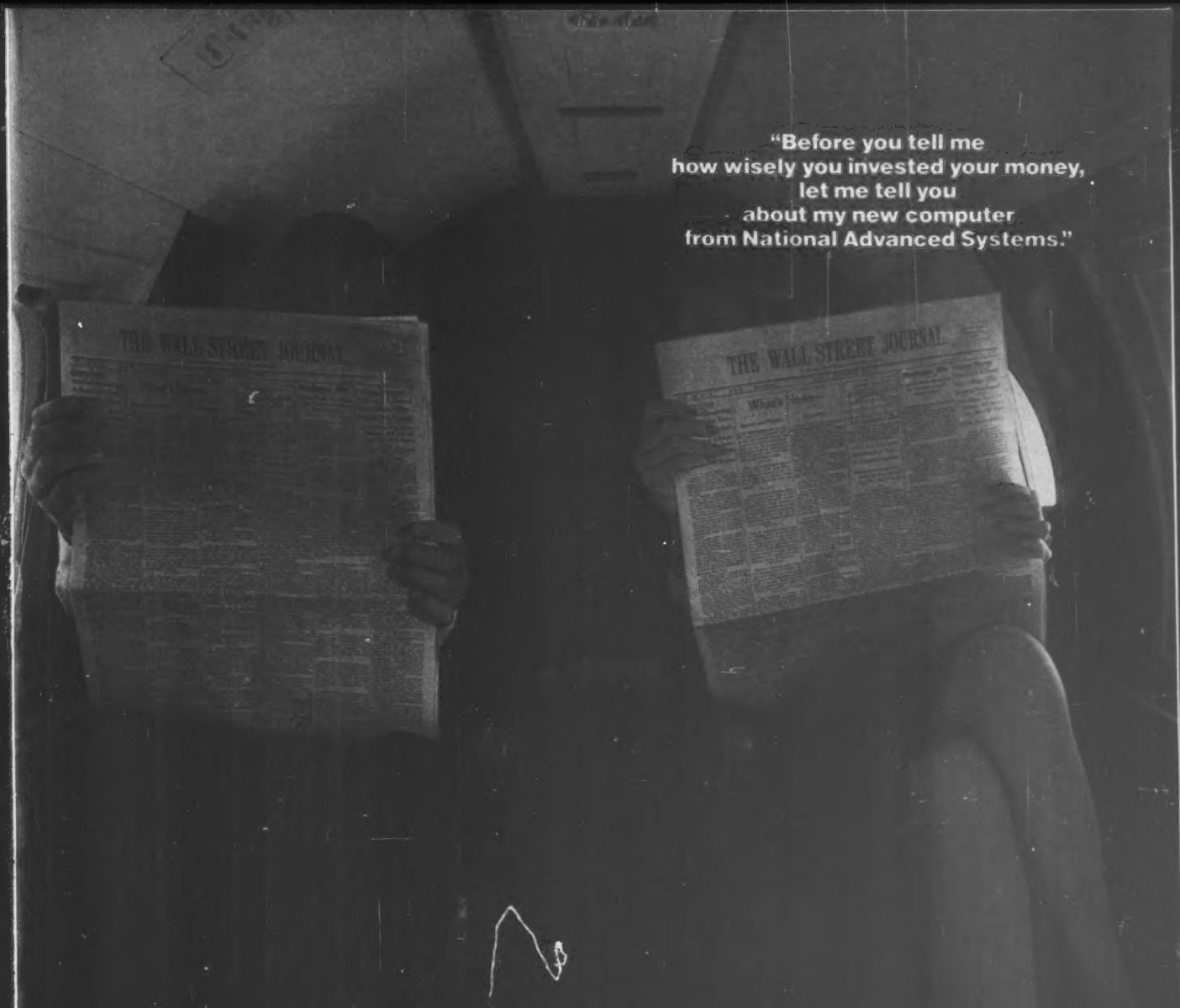
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Data Briefs

CRT Unit Available For Critical Displays

NORTH HOLLYWOOD, Calif. — A 5-in. CRT terminal designed for critical display applications is available from Audiotronics.

The DC-946-30 is available with composite video or transister-to-transister logic and includes a plug-in circuit board to minimize downtime and mean time to repair. Other features include minimum geometric distortion, 650 lines of resolution, plus internal controls for brightness and vertical/horizontal size, linearity and hold.

The approximate price for the CRT terminal is $200. Audiotronics can be reached through from P.O. Box 3997, 7428 Bellaire Avenue, North Hollywood, Calif. 91609.

CRT Terminal Debuts From Kimtron Corp.

SANTA CLARA, Calif. — Kimtron Corp. has unveiled a CRT terminal with high-resolution, nonglare green display, a detachable keyboard and tiltable screen.

The ABM 85 has full video attributes, advanced editing with wraparound, 25th status line, line graphics, programmable function keys, numeric and edit key pads and a buffered bidirectional auxiliary port. It will display 128 Ascii characters and operate at speeds to 19.2K bit/sec.

The CRT terminal costs $995 from Kimtron at 2255-H Martin Ave., Santa Clara, Calif. 95050.

Price Cuts, Advances Wait for Teleprinter

KENT, Wash. — A price reduction from $2,550 to $2,295, along with enhancements, are in store for Mannesmann Tally's 1,200 bit/sec MT-1612 keyboard send/receive (KSR) teleprinter.

The print speed has been increased to 200 char./sec, it has a nine-needle print head and buffer size has been upped to 2,048 char. In addition, the MT-1612 KSR can be configured with Ansi standard control codes for full Digital Equipment Corp. LA-120 compatibility, allowing the unit to operate on a DEC on-line network without software modification.

Concurrently, the MT-1612 receive-only model has been reduced to $1,945. Further details are available from the vendor at 8301 S. 180th St., Kent, Wash. 98031.

Time Domain Mux Extends Circuit Use

SUNNYVALE, Calif. — A time domain multiplexer that reportedly allows users of private metallic circuits to quadruple the number of terminals serviced by existing circuits is available from Telmac, Inc.

The Amux-1 has a built-in line driver which meets the requirements of Bell publication 43401. It is designed to ensure high reliability and long life in a continuous operating environment. It also has built-in diagnostic and convenience features which assist in bringing up new circuits or isolating faults on existing ones.

The Amux-1 costs $895 from Telmac at 770 Privet Court, Sunnyvale, Calif. 94086.

Codex Doubles DNCS 200 Capacity

MANSFIELD, Mass. — Codex Corp. has doubled the line capacity of its DNCS 200 Network Control System. The enhanced DNCS 200 will support up to 16 lines.

The enhanced control system reportedly gives small system users the same capabilities of the higher level DNCS 300, which include monitoring of analog line parameters, on-line storage of network configurations, bit error rate and poll testing and line dial backup and modem substitution.

The DCNS 200 is upwardly compatible with and upgradeable to the DCNS 300 and 400 systems. A typical installation costs approximatley $14,000, Codex said from 20 Cabot Blvd., Mansfield, Mass. 02048.

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ATM Runs on Processors Compatible With IBM 370

FUQUAY-VARINA, N.C. — A fully integrated turnkey automatic teller machine (ATM) management system operating on IBM 370 software-compatible mini-host processors is available from Software Development and Maintenance, Inc. (SDM).

The OCM24 Automated Teller Management System (OCM24/ATMS) centralizes all ATM operations in a standalone environment independent of a user's mainframe computer.

The system can manage large or small networks of single and multiple vendor ATMs in direct or loop attached configurations and can be used as a switch processor in interchange network operations.

The ATMS 32-bit mini-host processors provide throughput compatible to IBM 370/128 and 370/148 processors. They were designed for high-volume communications processing and large volume data management operations using standard 3330 and 3350 type disk drives.

The system starts at $125,000 from P.O. Box 668, 134 Spring Ave., Fuqua-Varina, N.C. 27526.

Hyperchannel Gets Adapter

MINNEAPOLIS — Network Systems Corp. (NSC) has unveiled an adapter for its Hyperchannel network product line that allows the interconnection of high-speed IBM printers to the Hyperchannel network.

The Model A512 allows 1403, 3211 and 3800 printing systems to be placed at distances of up to 5,000 feet on a local network and up to 25 miles (via the vendor's A710 link adapters) from the central computer center with minimal loss of performance.

The H012 device communications drive software package has also been enhanced to support the A512 capabilities. The A51X adapters sell for approximately $40,000 and the H012 software is available at a first copy price of about $400/mo, NSC said from 7600 Boone Ave. N., Minneapolis, Minn. 55428.

CRT Extends CSC Services

EL SEGUNDO, Calif. — An intelligent CRT terminal that extends Computer Sciences Corp.'s (CSC) range of distributed processing services is available from that vendor.

The IS50 serves as a front-end processor to CSC's Infonet computing network and can also be used for local processing and storage as well as word processing.

Using it, operators can enter and validate data on-line with the host or in a local mode. Its Basic interpreter and DOS also allow users to manipulate data and format and generate reports without calling on the host, according to a vendor spokesman.

The IS50 costs $325 under a two-year commitment agreement, $375 under a one-year agreement and $425 on a monthly basis, CSC said from 650 N. Sepulveda Blvd., El Segundo, Calif. 90245.

Graphics Board Out For VT100 Units

SANTA CLARA, Calif. — Selnar Corp. has announced a graphics board for Digital Equipment Corp. VT100 terminals.

The single-board unit is field-installable in the terminal's card cage. Features include normal point plots, incremental plots and emulation of Tektronix 4014 graphics terminals, according to the vendor.

Units cost $1,495, the vendor said from 437-A Aldo Ave., Santa Clara, Calif. 95050.

Unit Emulates Model TD 832

FREMONT, Calif. — A CRT terminal that emulates the Burroughs Corp. Model TD 832 is available from Emulog, Inc.

The Model 932 comes with 8K bytes of random-access memory, RS-232 and synchronous or asynchronous interfaces and an independent addressable printer port. No switches are required for formatting since a programmable nonvolatile memory is built in.

The terminal also features dual-page capability, built-in concatenation and a detachable keyboard. The Model 932 costs $1,895 from Emulog, 3730 Yale Way, Fremont, Calif. 94538.

Terminal Acts Like TD 830

LIVONIA, Mich. — A terminal said to save from 33% to 50% of Burroughs Corp. terminal users' costs has been announced by 3 PM, Inc.

The ADM 31 Burroughs Emulator, said to mimic the Burroughs TD 830 and MT 983, is based on a Lear Siegler, Inc. ADM 31 with special firmware added.

Features include two pages of screen display, upper- and lowercase keyboard including 15-key numeric keypad, serial printer port, daisy-chaining port, RS-232C and TDI asynchronous communications and monitor mode for diagnostics.

The terminal costs $1,550 from 3 PM, 30881 Schoolcraft Road, Livonia, Mich. 48150.

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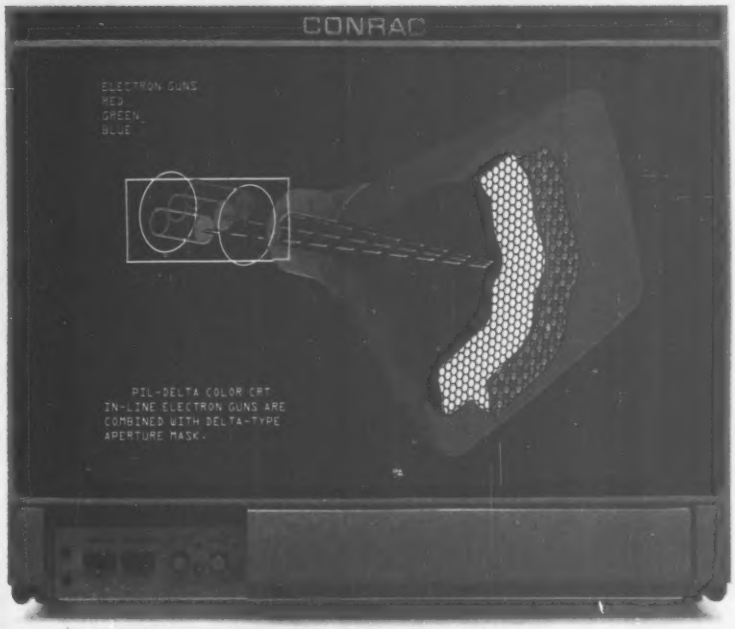

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Predicting Future Demands — Part 1

Capacity Planning Can Keep DP Going

By Leon G. Rittenhouse
Special to CW

In this first part of a two-part series, Leon G. Rittenhouse examines the problems involved in measuring a computer's current work load capabilities and projecting processing needs in the future. Next week, he explains how a simple formula, based on a computer's millions of instructions per second rating, can predict future DP demands.

It is probably no secret to users in the know that when a company's computer goes down, operations at that firm could come to a grinding halt.

In a lot of cases, large-scale computers were designed to handle sometimes hundreds of concurrent users and to perform a variety of tasks. That same computer could also be coordinating hundreds of batch processing jobs. So when the machine stops or an on-line facility is suddenly sluggish, the organization could be irreparably hurt.

It makes sense, then, to plan for such occurrences, even before the initial hardware is installed and plugged in.

Keeping this in mind, more and more data processing organizations are developing capacity planning and performance monitoring functions that can be used to compare the estimated volume of work to be performed with the level of service expected from the computer system.

Capacity planning and performance monitoring are two interrelated functions. While the former deals with the volume of work to be performed, the latter focuses on the level of service rendered by the system. However, since the function of capacity planning is measuring the current volume of work and forecasting future work loads — to ascertain future hardware and software needs — that is probably the more crucial function.

Most forecasting involves monitoring the past and current information, then projecting it as a base. Incorporating empirical knowledge of related future plans into a projection is important, but using historical data is also key to projecting needs. It is necessary to monitor these historical work load trends.

The computer must not only be able to process the work load, but it must also be able to do it at an acceptable level. Acceptable levels of service mean different things to different users. For instance, to an on-line systems user, response time is a major factor in acceptable performance. To a batch user, the time it takes to accomplish a specific task is usually an accurate degree of machine performance measurement.

The relationship between work load and level of service is somewhat unusual. As more and more jobs are input to the computer and the work load increases, there may be a barely perceptible decline in the system's performance. However, the system will soon reach a point where adding more work drastically degrades the service level. Therefore, it is vitally important to keep the work load balanced and within this acceptable level. If the user does not know where this point lies, the situation can suddenly turn severe when the machine slows down from the work load pressures.

Performance Monitoring

Performance monitoring can help the user get a better understanding of where a computer's point of degradation lies. Monitoring usually takes the form of measuring "rates" and "times" for processing, such as start I/Os per minute, response seconds and paging rates.

Measures of inputs and outputs would be expressed ideally in terms of bytes or characters, for example, how many bytes or characters of data the computer processed and output during a specific time of day. However, character counts are not always readily available.

The next best thing is to measure the number of I/O operations performed by the computer. Although record and data block sizes can vary thousands of bytes, most DP shops maintain fairly specific limits and do not alter these limits at short notice. So, if nothing else is available, measuring the number of processing I/

(Continued on Page 68)

STC's 3370-Compatible Drive Now Attaches to Dasd Adapter

LOUISVILLE, Colo. — Storage Technology Corp.'s (STC) 8370 disk drive — which is compatible with IBM's 3370 device — can now be attached to IBM's direct access storage device (Dasd) adapter, housed in the firm's 4331 processor.

STC's 8370 drive, announced in October 1980, can be used on the 4300 CPU without hardware or software alterations, an STC spokesman said. In addition, when attached to STC's Dasd adapter, the 8370 drive can be maintained remotely.

The 8370 disk drive uses thin-film technology to achieve 571M bytes of storage per spindle, a 20 msec seek time and a 1.8M byte/sec transfer rate. The unit employs a fixed-block architecture recording format, which is said to eliminate the device dependence that is characteristic of count key data types of devices.

The 8370 disk drive, with adapter, ranges in price from $27,846 to $51,030. Two-year lease costs range from $678/mo to $1,274/mo.

Present 8370 disk drive users can have the adapter added to their units in the field. However, a price has not yet been set for the upgrade, according to the STC spokesman.

Shipments of the disk/adapter combination are expected to begin during the third quarter of 1982 from STC at 2270 S. 88th St., Louisville, Colo. 80027

Calcomp User Group Formed

ANAHEIM, Calif. — California Computer Products, Inc. has established a users group that will promote discussion and hold workshops focusing on the company's interactive graphics systems.

The group's first annual meeting is scheduled to be held here Feb. 8-10 and is open to both domestic and international users. At this time, officers will be elected, bylaws and objectives established and presentations on product status will be held, a Calcomp spokesman said.

The selection of a name for the group as well as planning activities and services will also take place, he added. In addition, workshops are being planned for such special interest groups as architecture and piping.

Further information on the group and its initial meeting can be obtained from Jeanne Layton at Calcomp, 3320 E. La Palma Ave., Anaheim, Calif. 92806.

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VT 50	DECscope CRT		
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NOTE: Also DEC high speed printers — LP 11-AA, BA and WA models.

TI Availabilities

TI-743
TI-745
TI-745 — full Ascii
TI-765
TI-783
TI-785
TI-787
TI-810/820P's

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Leasing Program Offered For PE's 3200 Superminis

OCEANPORT, N.J. — Perkin-Elmer Corp. is now offering a leasing program for its 3200 series of 32-bit superminis.

Applying only to domestic users, leases will be available for three or four years at rates consistent with other lending institutions, the vendor said.

Initially, the leasing offer is not available to nonprofit organizations and the lease will not be cancelable, according to the firm.

Leases start at $49,000/year, the firm said from 2 Crescent Place, Oceanport, N.J. 07757.

Racal-Redac Drops Price By More Than 40% on Cadet

LITTLETON, Mass. — Racal-Redac, Inc. has dropped the price by more than 40% on its basic Cadet computer-aided printed-circuit board design system.

The cost of the Cadet is now $29,500, down from $49,500, reportedly making it the lowest priced computer-aided design system on the market. The Cadet is a turnkey microprocessor-based interactive system that is geared to operate in commands familiar to the user.

Additional information on the system can be obtained from the firm at 1 Redac Way, Littleton, Mass. 01460.

Bits & Pieces

Stand-Alone System Makes Slides, Graphics

RESTON, Va. — Centec Corp. has introduced a microprocessor-based stand-alone business graphics system said to allow production of custom slides and graphics.

The first in a series, Centec II employs Ramtek Corp. display generators operated from a menu-driven system that reportedly allows the user to generate business graphics, store and update.

The single-user station consists of the Ramtek Model 6214 medium-resolution display terminal. Hardware and software cost $36,000, including on-site field service for one year. Centec is located at 11260 Roger Bacon Drive, Reston, Va. 22090.

8K Prom Michrome Bows, Utilizes Fuse Technology

SUNNYVALE, Calif. — Monolithic Memories, Inc. has introduced a 4-bit wide 8K-byte programmable read-only memory that utilizes nickel chromium fuse technology.

The 5388/6388 and 5389/6380 memory is a member of the firm's 53XX/63XX generic nickel chromium family. Like its predecessors, the new memory features low input current inputs and full Shottky clampings. The michrome fuses store a logical high and are programmed to the low state, a spokesman said.

The memory chip is available in two speed ranges: 70 nsec and 55 nsec and costs about $10 each from the firm at 1165 E. Arques Ave., Sunnyvale, Calif. 94086.

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Capacity Plan Boosts Uptime

(Continued from Page 67)

Os is probably a very satisfactory measure of a system's work load.

Now that you know what you want to measure, how do you go about measuring it?

Measuring Methods

In most cases, I/O measures can be monitored by device types: tapes, disks, printers, local and remote CRTs, scanners, card readers and other peripheral devices; by application area, such as accounts payable, general ledger and so on; and by data processing category, on-line production, on-line development, batch production and data base functions.

The remaining element to be monitored is the "process" portion of the computer system. The most common measure used for this task is the CPU time or that time actually taken up by the processor during the work phase.

Measuring CPU time can be as simple as subtracting the number of minutes the computer was active from the number of minutes in a day. For example, if the computer ran for 1,440 minutes one day, but was down or idle for 28 minutes, the processing time could be represented as 1,412 minutes.

To get an even clearer picture, the amount of time spent by the computer waiting for input or output can be subtracted from the above total. For instance, if 263 minutes of time were spent in waiting and this was subtracted from 1,412 minutes of active processing time, the final CPU time would be 1,149 minutes.

Roughly, this means that 81.4% of the processor's time was actually used to process data.

Further Analysis

The CPU time can be further broken down to take into consideration the number of minutes directly attributable to programs run during this period, or the number of minutes taken up by the operating system used to run the whole processing show. These figures can usually be obtained by subtracting program time from the final processing total.

Unfortunately, while CPU minutes do measure the processing workload, it is not a common unit of measurement. If there are several CPUs on the floor and their processing speed is different, it is not considered accurate to combine the CPU minutes of work on one system with the minutes of another system to measure the total systems work load.

Rittenhouse is a technical service manager with McCrory Stores in York, Pa.

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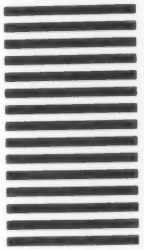

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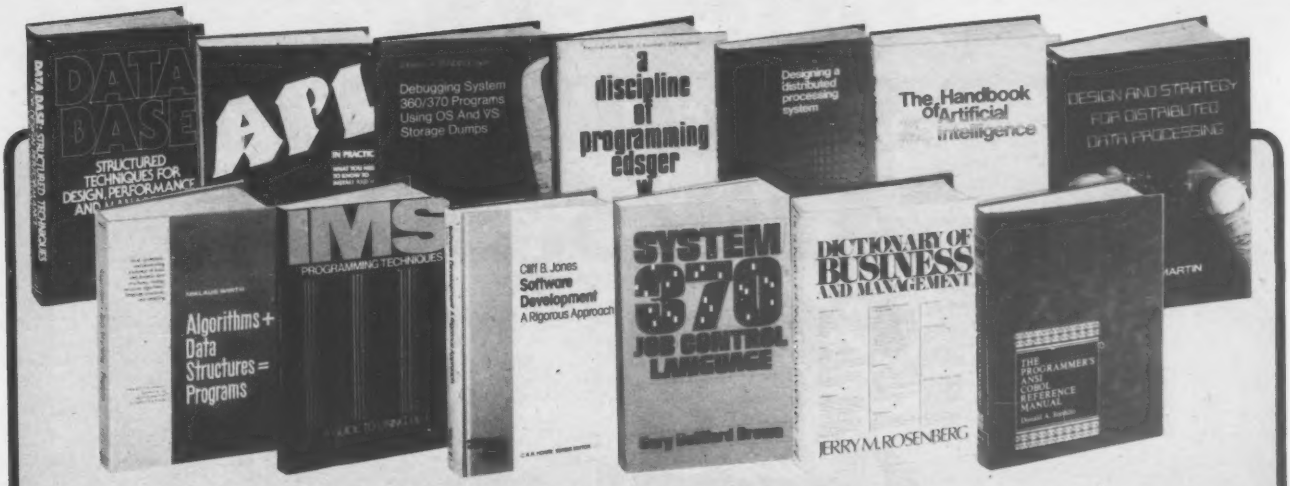
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Overcomes Christmas Rush

Micro Serves Retailer as Santa's Helper

PITTSBURGH — Santa's helpers are normally thought of as short, dressed in red and sporting pointed ears. But for a local retailer, Santa's helper is a little on the boxy side.

Here at the Joseph B. Dahlkemper Co., the only way the chain of merchandise showrooms in Pennsylvania and Ohio could cope with the Christmas rush was to install an in-house microcomputer. Working with Transcomm Data Systems, Inc., a Digital Equipment Corp. distributor and software house, the firm bought a DEC PDP-11/70 equipped with Transcomm's specialized software.

"We do 60% of our business in the last three months of the year," reported company President Joseph B. Dahlkemper. "During the Christmas season inventory levels can change drastically in just a day. We needed a computer system that would provide us with inventory information in order to decrease out-of-stocks and increase customer satisfaction. With the Transcomm On-Line Accounting System (Tolas) and the DEC PDP-11/70, our 1981 Christmas season was our most successful ever."

No stranger to computerized inventory control systems, Dahlkemper first converted from a manual to a computer batch system in 1976. Operating on a rigid service bureau schedule, this system at Dahlkemper was often at least a week behind in entering new information, Dahlkemper said.

"At Christmas, the information time lag became critical. Out-of-stocks increased. Lost sales rose. We learned from this experience that it was vital to have a computer system that remained current even in our busiest times," the company said.

To get that current information, the company converted to its own in-house computer system using DEC hardware and Transcomm's Tolas software. Specifically, it includes Tolas systems for sales invoice processing, sales analysis, purchase order management, transfer management and inventory management as well as accounts payable and financial reporting. The software operates on a DEC PDP-11/70 with five RM03 disk drives. Accessing this hardware are 34 interactive DEC VT100 terminals and eight DEC LA120 line printers distributed between corporate headquarters and six remote showroom locations. This system today effectively controls more than 26,000 separate inventory items from baby carriages to watches, the firm said.

"Everything is right now," reported Norine Burkett, assistant manager of Dahlkemper's Eastway showroom. At the showroom level, data concerning sales, requested transfer of merchandise and received purchase orders are entered daily by terminal into the system. Using the same terminal, queries concerning the availability of merchandise at other locations are made by showroom personnel.

"The system has made us more responsive to customers," Burkett added. "Now we can tell them immediately if we have the requested item in another location or if we are totally out of stock. It has increased by 100% our awareness of out-of-stock situations so they can be corrected.

"The system identifies needs for us and triggers our attention to specific problems well in time to act," agreed Robert H. Schultz, vice-president and director of merchandising.

"It provides each of our seven buyers with up-to-the-day information on on-hand quantities and purchase order status. Each buyer — through their own terminals — has access to information concerning any stock keeping unit. Inquiries take only seconds to run. Hard-copy reports, like the key order-to-buy report, can be generated within minutes. Because all the necessary information to help me and my staff make better decisions is available faster, we have the opportunity to stay on top of inventories," he said.

Mini Bits

Turnkey Offered to Insurers

NEW YORK — A turnkey microcomputer-based insurance agency management system that can handle up to 999 types of coverage for small to medium-size insurance agencies has been announced by Lifeboat Associates.

The Series 9000 computer system provides a full description and standard premium rates charged by each insurance carrier; can store carriers with appropriate agency commission for each type of coverage; and can maintain agency and producer files with month, year and last year-to-date commissions earned. The system's programming includes files for claim history and coverage code and can reportedly provide detailed or summarized reports for agencies, clients and insurers.

The system is compatible with CP/M-compatible operating systems, a spokesman said. Lifeboat Associates is located at 1651 Third Ave., New York, N.Y. 10028.

Turnkey Out for Distributors

EDISON, N.J. — Jami Systems, Inc. has introduced a turnkey system for distributors, retailers and franchisers.

Said to feature reports that rank each item carried in terms of profit, unit sales, dollar sales or other variables, the IMA-1000 was designed to cover all facets of a business from inventory management to billing, accounting, sales analysis and forecasting.

The system, which offers multitasking, multiuser capabilities carries a 90-day return option, "no questions asked," according to spokesman. The standard package includes a 16-bit CPU with 10M bytes of hard disk storage, expandable to 360M bytes; 96K bytes of main memory, expandable to 1K bytes; one CRT terminal, expandable to eight; and a 150 char./sec printer.

The basic system costs $30,000 from Jami, 15 Brookfall Road, Edison, N.J. 08817.

Turnkey Compatible With 370

MOUNT LAUREL, N.J. — Harfst Associates, Inc. has announced a turnkey system based on a Formation, Inc. F/4000 processor. The system is aimed at manufacturing and accounting applications.

The system runs the firm's IBM 370-era software without alteration and is compatible with IBM 370 and compatible mainframes, the vendor said.

Systems cost between $150,000 and $250,000 and will be available in the first quarter of 1982, the vendor said from 2205 Fortune Drive, San Jose Calif. 95131.

Modcomp Extends Disk Line

FORT LAUDERDALE, Fla. — Modular Computer Systems, Inc. has added an 8-in. rigid disk drive to its product line.

The drive, called the 4181, provides 13.5M bytes of formatted disk storage, 6.75M bytes of fixed media and 6.75M bytes of removable media, the vendor said.

The firm also announced the Model 4180 controller for the drive. Called the Model 4180, the unit attaches to the firm's Classic processors and controls up to two drives.

A 13.5M-byte disk drive with the controller costs $11,775. An additional drive costs $6,475. More information is available from the vendor through P.O. Box 6099, 1650 W. McNab, Fort Lauderdale, Fla. 33310.

Dynabyte System Mixes Tape, Disk

MILPITAS, Calif. — A multiuser tabletop business computer said to combine the highest capacity 5¼-in. Winchester disk drive with a cartridge tape drive is available from Dynabyte, Inc.

The Dynabyte 5710 reportedly will allow users to copy the information stored on the disk onto the tape in less than 15 minutes.

The 5710 features a hard disk drive with on-line storage capacity of 10.7M or 16M bytes and a 17M-byte cartridge tape drive with a backup speed of 2M byte/min. Up to eight terminals and 16 printers can be connected to the 5710.

The 5710 Model A1 with 10M bytes of hard disk capacity and a 17M-byte cartridge tape drive costs $8,995, while the Model B1 with 16M bytes of hard disk capacity costs $9,995 from 521 Cottonwood Drive, Milpitas, Calif. 95035.

Prodigy System Based on Z80A

ISELIN, N.J. — Prodigy Systems, Inc. has announced a small business system based on the Z80A microprocessor.

The system incorporates Prodigy's Protege computer language and can be adapted to various data base management applications.

Information can be retrieved or printed using a combination of 1,024 user-defined categories. A text editor is available to generate letters and reports.

Systems cost $12,500, the vendor said from 497 Lincoln Highway, Iselin, N.J. 08830.

System Centered On PDP-11/23

SAN JOSE, Calif. — ZZY Systems, Inc. has announced a small business system based on the Digital Equipment Corp. PDP-11/23.

Called the Z-11/23-75, the unit includes a 165M-byte Winchester disk drive, a 75 in./sec vacuum column tape drive and compatibility with DEC software.

The system includes 256K bytes of main memory and uses a four-point serial interface with DEC VT-100 terminals.

Systems cost $45,100, the vendor said from 1900 Lafayette St., Santa Clara, Calif. 95050.

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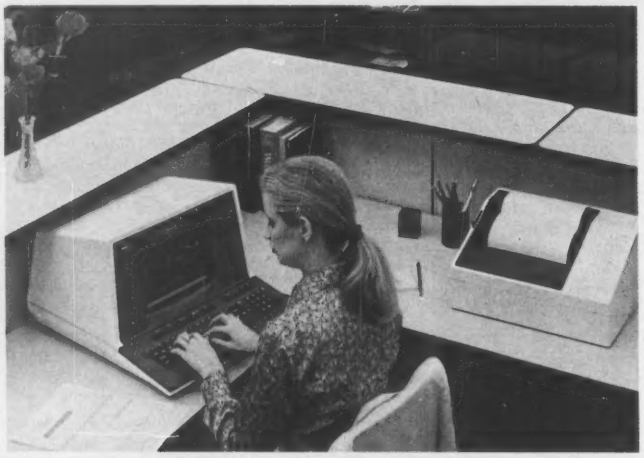
Compact 6410 matrix printers, that print at a constant 90 LPM, are available with either tractor or friction feed. The 7900 CRTs, with models that operate in block, page or character mode, are also available with either fixed or detachable keyboards.



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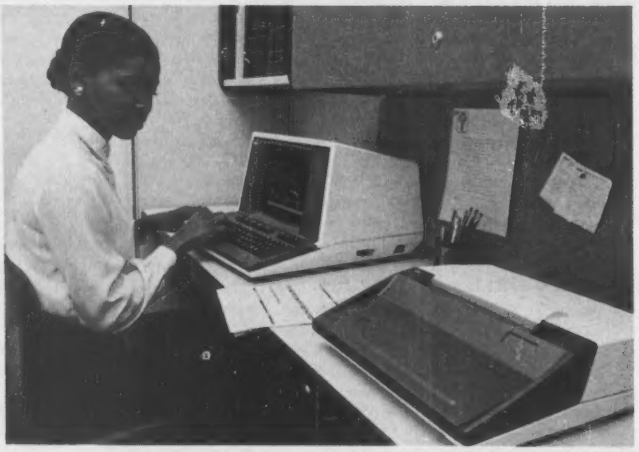

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EMS Package Delivered For RSTS

ESCONDIDO, Calif. — North County Computer Services has unveiled an electronic mail software package for Digital Equipment Corp. computers using the RSTS operating system.

Intecom introduces computer-assisted correspondence management and calendar scheduling as an integral part of a total package. Intecom exchanges messages among designated users of any RSTS system and notes each transaction in the user's "In," "Out," and "Hold" baskets.

The package supports multiple user domains, group sending, message forwarding and replying and dated message sending.

A single CPU license fee for the software is $2,880, North County said from 2235 Meyers Ave., Escondido, Calif. 92025.

Analyst Accuses OA Vendors Of 'Humane Interface' Neglect

By Phil Hirsch
CW Washington Bureau

Office automation equipment vendors are paying too much attention to "the details of knobs and dials" and not enough to development of a "humane interface," according to James H. Bair, manager of office systems research at BNR, Inc. in Mountain View, Calif.

Bair has been analyzing online office systems for several years. He is manager, office systems research, for the U.S. affiliate of the Canadian telephone industry's major research and development laboratory, Bell-Northern Research.

Because the development of a humane interface has been neglected, Bair contended, the currently available office automation systems are not any more cost-effective — and sometimes are less cost-effective — than the systems they supplant.

As he put it, "There are numerous situations where the time to complete a task using an automated office system has been greater than by conventional means. If office systems are to be justifiable, then the interface must be designed to address new applications and not be encumbered by previous data processing interface designs and design practices."

This idea — that current office terminal interfaces are a carryover from data processing applications — is Bair's key point. The corollary is that the office environment includes some unique characteristics.

"Office systems are used primarily to process unstructured information — that is, text — whereas data processing or 'transaction processing' systems process more structured information — that is, forms and numbers," he explained.

Operators involved in transaction processing tend to be specialists who deal with well-defined tasks. They are "order entry clerks, airline reservation agents, programmers or management information systems [MIS] data base operators, for example," Bair said. Office terminal operators, by comparison, typically are "nonspecialists" — secretaries or managers, for example — who have a variety of duties that involve the use of multiple office services.

From this difference come some others, according to Bair.

He contended that the specialist user is largely dependent on the computer. Essentially, he "has no choice" and will, as a result, "tolerate poor design" and less than optimal performance.

The nonspecialist user, however, "does not need to use computer technology for completion of his job." He "already has adequate tools to accomplish what he was hired for — that is, paper, telephones and viewgraphs." Therefore, "new tools must be at least as easy to use and as reliable and responsive as the old tools" or "disuse is likely," he said.

Bair added that "there has long been implicit recognition of this fact," as reflected in the generally accepted belief that "managers will not use typewriters," but "it remains a problem insufficiently addressed by designers of office systems," he said.

Bair added that "a knowledge [office] worker needs so many potential services — that is, MIS, libraries, document production, phone answering — that it is difficult to attempt to provide a single system" for all applications. The usual result is that several systems are installed instead, which presents another problem — the need for the user to learn multiple, different command languages, he said. Advances in computer hardware and software increase the complexity.

Key to Problems

The key to all these problems, according to Bair, is development of a standardized terminal front end and command language that would enable the user to interact with the entire range of office systems and services, that is, a "humane interface." The front end interprets what the user specifies and then interacts with "back ends" that will perform the actual operation, he explained.

"The front end can be customized for each user, but is basically consistent no matter what back end is used," Bair explained.

The command language should be organized into subsystems so that vocabularies for new services can be added easily. Each subsystem should be further subdivided into proficiency levels, which would help beginners learn the language more easily.

"The grace period for inhumane interfaces is rapidly nearing an end," Bair said. "Past inattention to coherent, intuitive and natural interfaces, if continued, will cause a loss in knowledge worker efficiency and, hence, productivity.

"A convivial interface is needed that is gentle with the user's senses and tolerant of his imperfections," Bair said.

Version 5.1 of 'Intelex' Out; Includes Six More Facilities

HOBOKEN, N.J. — Version 5.1 of Arbat System Ltd.'s Intelex electronic mail and advanced message-switching system includes six additional facilities.

A microfiche link enables Intelex to generate an image of messages in the format required for microfiche and index them.

The message accounting feature computes the time and cost of traffic on telex, leased lines or whatever transmission media is being handled.

Departmentalization enables users to isolate the Intelex displays and information according to the different departments that use them.

Code expansion reduces the length and expense of messages that contain a large amount of standard information.

Message splitting cuts up long telex messages that are actually many messages addressed to a variety of departments or different locations.

Journal history reporting provides a complete history of each message in terms of content, who sent it, when it was sent, when it was received and so on.

Version 5.1 costs between $45,000 and $100,000, Arbat said from Arbat Plaza, Hoboken, N.J. 07030.

Device Turns WP Station, Micro Into Mail Transceiver

LINCROFT, N.J. — A device said to turn a word processing station or microcomputer system into an electronic mail transceiver is available from Equinox Data Systems, Inc.

The IS-300 allows a serial printer to be accessed from the word processor or a modem for communications. Initially the IS-300 will connect the word processor to the serial printer.

However, with an incoming telephone call, the device automatically switches the printer to the modem and inhibits the word processor from trying to send its data to the printer. Once the transmission is completed, printer control will return to the word processor.

The IS-300 costs $499, Equinox said from 517 Newman Springs Road, Lincroft, N.J. 07738.

Alphaword, IBM Unit Tied

TETERBORO, N.J. — Compuscan, Inc. has unveiled an interface that connects its Alphaword III optical character recognition page reader to IBM's Display Writer.

The interface and high-speed data entry system can reportedly read text typed on an IBM Selectric or other single-element typewriter at a rate up to 270 page/hour. Accuracy is rated at less than one character substitution per 300,000 scanned characters, a spokeswoman said.

The interface costs $2,000 from Compuscan, 900 Huyler St., Teterboro, N.J. 07608.

'CP 250' Gets Enhancements And Price Cut

FOREST HILL, Md. — Maryland Computer Services, Inc. has announced enhancements to its Corresponding Processing (CP) 250 package, which combines word processing features with Hewlett-Packard Co.'s Image data base management system for the HP 250, and reduces the software's price.

New enhancements include a wrap-around feature, which permits progression from line to line without hitting the enter key; a search and replace feature; and document linkage, which allows the linkage of documents by print order, the vendor said.

A new math function permits calculations on a column or row of figures for tables within the CP 250 document.

With the new features, the price of the package has been reduced to $1,500. A demonstration disk is available for $100, the vendor said.

Maryland Computer Services is located at 2010 Rock Spring Road, Forest Hill, Md. 21050.

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CI Notes

Itel, Lloyd's Reach Settlement On Losses From 370 Leases

SAN FRANCISCO — Itel Corp. has reached an agreement with Lloyd's of London for the settlement of outstanding claims related to losses on revenues from IBM 370 computer equipment.

Itel, which filed for bankruptcy a year ago, had a potential liability of $300 million for those transactions. However, that liability has been reduced to $100 million, according to an Itel spokeswoman.

Under the recently negotiated agreement, Lloyd's will continue to settle directly with banks and other institutions that financed Itel computers.

In addition, Itel will receive $4 million from Lloyd's and an escrow account of $2 million that will be released by Lloyd's, according to the spokeswoman.

Hewlett-Packard Establishes Computer Terminals Group

PALO ALTO, Calif. — Hewlett-Packard Co. has established a Computer Terminals Group to consolidate its position in computer terminals, manager workstations and personal office computers.

The group encompasses all HP facilities involved in the design and manufacture of terminal products as well as the firm's General Systems Division. It will complement, but not include, HP's Desktop Computer Division.

Cyril J. Yansouni is the general manager of the group. He will also continue as general manager of the Data Terminals Division.

AM International Reports Unaudited Loss of $245 Million

CHICAGO — AM International, Inc. reported an unaudited loss of $245 million or $26.71 per share for its fiscal year ended last July. This loss included $203 million of accounting adjustments resulting from a special review of business and accounting matters initiated by the company last April.

During the fiscal year AM announced plans to divest seven of its 12 areas of business, sell various real estate and leaseholds and close, combine or relocate facilities.

The units already divested or up for sale, including its AM Jacquard Systems data and word processing operation, contributed 25% of the company's revenues in fiscal 1980 and comprised 29% of the firm's assets for that year.

Latest Study by HP Finds Made-in-U.S. 16K RAM Chips Match Japan's in Reliability

By Robert Batt
CW West Coast Bureau

PALO ALTO, Calif. — U.S. companies are fast catching up on their Japanese counterparts as far as building a reputation for reliability goes, if a just-released study is any indication.

A study of U.S. semiconductor manufacturers carried out by Hewlett-Packard Co. revealed that in the 16K-bit random-access memory (RAM) market, at least, the competition is now more nearly one of company vs. company rather than country vs. country.

At the same time, HP admitted it has yet to identify a company that consistently exceeds the best of the Japanese. U.S. companies are slam-bang in the middle of the competition, according to Richard Anderson, general manager of HP's Computer Systems Division.

Failure rates among more than 140,000 ceramic 16K RAMs tested in the first nine months of 1981 varied between seven and 30 failures for every 10,000 units. This was among six suppliers — three U.S. and three Japanese.

The study showed that both the lowest and the highest failure rates were exhibited by Japanese manufacturers.

Again over a similar time span, HP tested three million plastic 16K RAMs. Failure rates varied between 12 and 33 per 1,000 units. Five Japanese and one U.S. supplier were used in the study, with the American firm coming out in the middle of the pack.

Anderson added that no U.S. supplier had yet been qualified by HP to supply the company with the more complex 64K RAMs, although he said this may occur over the next few weeks.

The HP survey follows on similar studies carried out over the past two years. [CW, May 26, 1980]. The latest results show a significant improvement in the quality and reliability of U.S. semiconductor devices.

As recently as January 1980, studies showed Japanese semiconductor products were six times as reliable as U.S. chips. This gap had closed to a threefold advantage by November 1980. Now, one year later, HP is saying the Japanese no longer have a significant advantage in the quality of their devices.

David Earle, HP's manager of quality and reliability for corporate materials management said, "Several years ago, the quality and reliability of Japanese semiconductors was considerably better than the U.S. counterpart. However, over the last couple of years we have seen a big improvement in the quality of semiconductor parts in general and U.S. components in particular."

Earle said U.S. suppliers were doing a lot more testing in response to the Japanese threat and were also working more closely with the end user to identify and resolve problems. They were also putting far more resources into the front end such as in the processing of silicon wafers, he addded.

For heavy users of chips, the emergence of U.S. semiconductor houses on an equivalent quality footing with the Japanese is a very welcome development.

Apart from any patriotic aspirations,

(Continued on Page 78)

PE Machine Makes 100 Wafer/Hour

GARDEN GROVE, Calif. — Perkin Elmer Corp. has developed a machine that reportedly breaks new ground in the production of high-powered semiconductor chips.

The Micralign 500 can produce up to 100 silicon wafer/hour — five times the number of wafers that can be produced by the current technology. At $675,000, the machine is cheaper than its older rivals, which typically carry a price tag of around $800,000.

PE is also offering a slower model, the Micralign 300, which costs $325,000 and produces up to 50 wafer/hour — three times the customary figure. Although the Japanese are thought to be potential customers for these new machines, the bulk of the orders is expected to come from the U.S.

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Supershorts

Candle Corp. has expanded operations in the UK by forming a subsidiary, Candle Ltd., in London.

— — —

Applied Digital Data Systems, Inc. has given the 25,000th Viewpoint terminal of the Viewpoint CRT terminal line to the Stony Brook Foundation at the State University of New York.

— — —

Lockheed Corp.'s computer-aided design and manufacturing organization began operating as a wholly owned subsidiary of Lockheed Corp. as of Jan. 4.

EG&G, Inc. has formed EG&G Interrech, Inc. to support current and future contract operations in the Mideast. Under an ongoing U.S. Navy contract that was recently increased by some $15 million, the new subsidiary is to support the developent and modernization of the Saudi Arabian Navy and related naval facilities.

— — —

Donald S. Bates, president of the United Telecom Computer Group, announced the formation of a new remote computing services business unit. United Information Services, Inc. will serve domestic and international operations of three remote computing services companies with more than 4,000 customers worldwide.

— — —

Software Module Marketing has announced the formation of SMM-Software Module Marketing GmbH, a wholly owned subsidiary located in Duesseldorf, Germany. SMM-GmbH will market SMM's products in Germany, Austria, Switzerland, The Netherlands, Belgium and Luxembourg.

— — —

The Continuum Co. has organized a separate operating subsidiary, Continuum Systems Research, Inc., to research and develop a new approach to system requirements of the life, health and annuity insurance industry.

— — —

Science Research Associates, Inc., the educational publishing subsidiary of IBM, will publish and distribute self-study course materials developed by the IBM Data Processing Division's Department of Education.

— — —

Dataquest, Inc. has established a group called Integrated Office Systems, which will concentrate on office-of-the-future technologies such as electronic office equipment including voice, data text, graphics and video communications.

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with experience in:
Sonar or Torpedo Technology;
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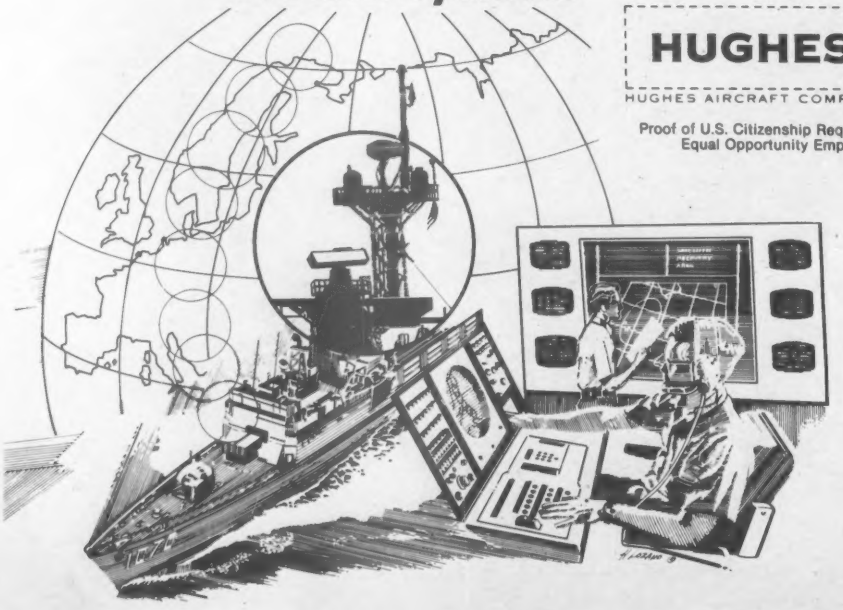

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U.S. Producing Better Chips

(Continued from Page 77)

these users depend on having available very large quantities of reliable chips. As such, they require more than one supplier. HP, for example, is a big user of dynamic RAMs. It is a key component in many of its systems. A failure could bring down a computer operation.

Another big problem for HP was access to reliable linear integrated circuits. A key concern of company officials was the ability of these components to withstand extreme humidity under operating conditions.

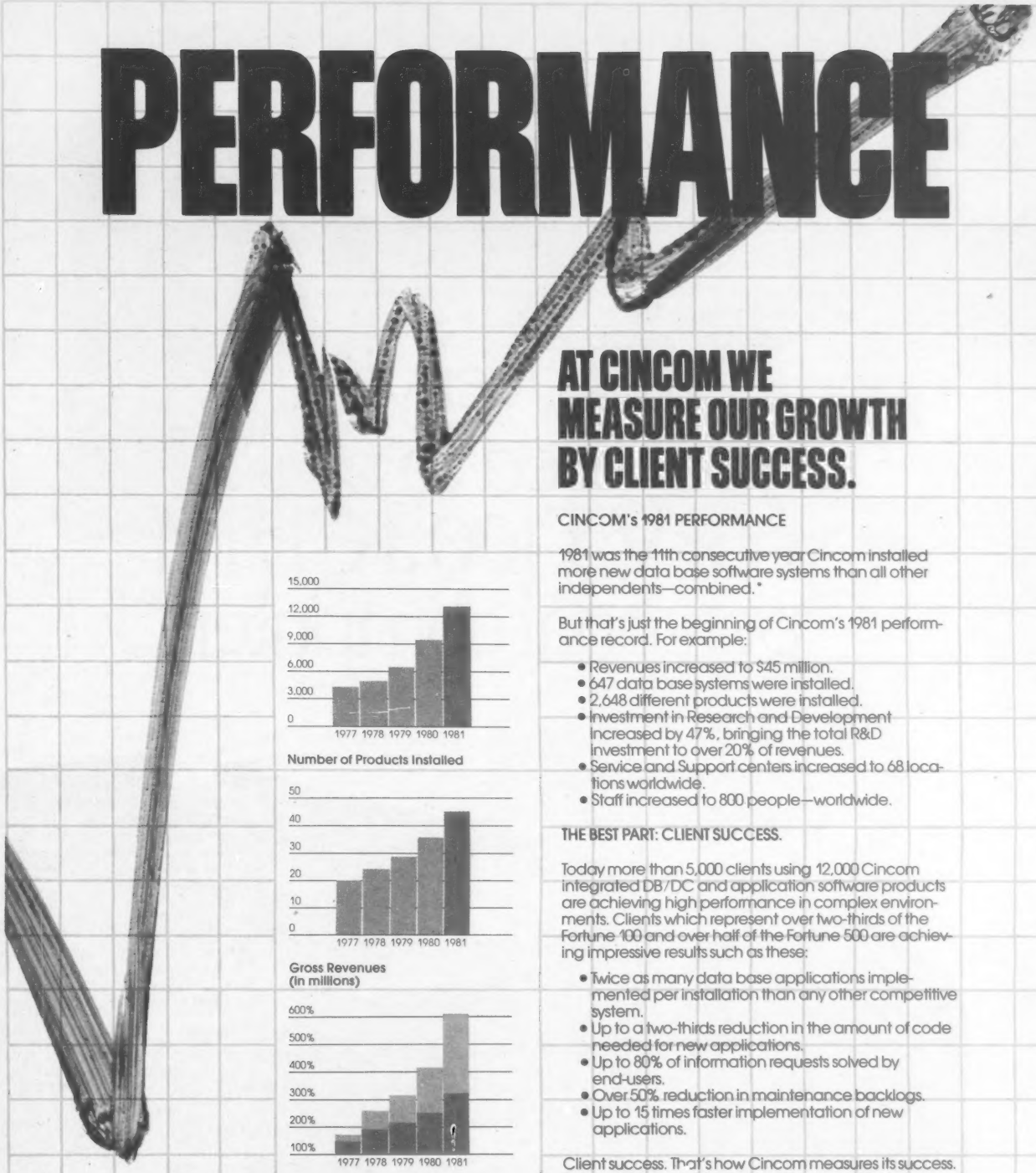
An indication of the rise in quality consciousness is demonstrated by the fact that in 1980 only 52% of the linear integrated circuits tested by HP passed qualifications. In 1981 this had risen to 75%.

Recognizing the marketplace for products that increase the quality and productivity of semiconductor manufacturing, the company is now beginning to produce equipment to be used in integrated circuit manufacturing. One of the ways it is doing this is to supply the semiconductor industry with application software packages. One of these, the IC 10, runs on the HP 3000 series and is used for the planning, scheduling and daily operations of wafer manufacture. Another package, the PC 10, is used in production engineering and process control.

A company spokesman explained: "The semiconductor industry has a tremendous investment in equipment. Therefore a 4% to 5% improvement in quality can have a tremendous payback, as much as $40 to $50 million." The company says it is looking at acquisitions to strengthen its hand in this market.

HP is concentrating its initial campaign to sell these software packages in the San Francisco Bay area where many of the top semiconductor companies have their headquarters. It has placed six hand-picked specialists in Silicon Valley to sell the systems. "The leaders of the industry are located here. If we are successful here it will have a magnifying effect across the country," the spokesman said.

PERFORMANCE



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Number of Products Installed

Gross Revenues (in millions)

Comparison of R & D expenditures to gross revenue.*

PERCENTAGE OF R&D INVESTMENT GROWTH
PERCENTAGE OF REVENUE GROWTH

*1976 Base 100% for R & D and Revenue.

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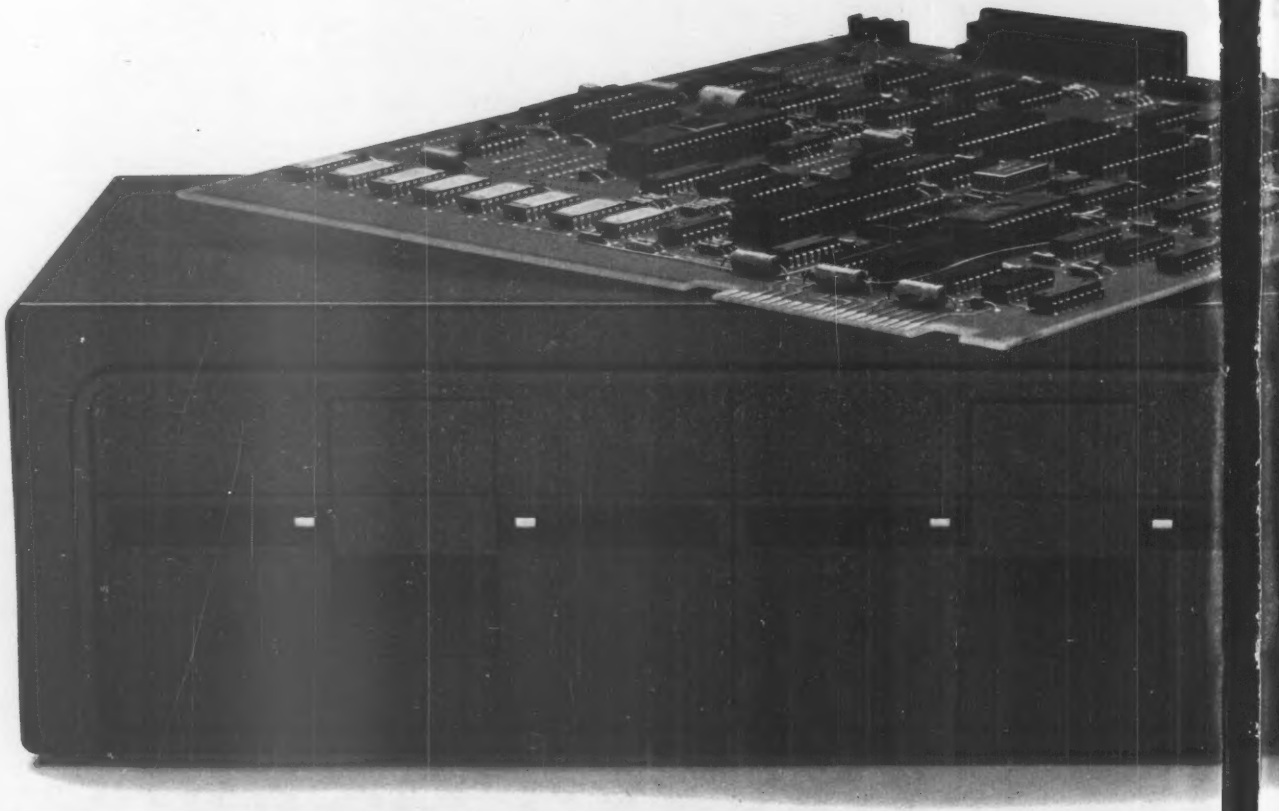

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If you've made up your mind to add personal computing capability to your office, Digital has good news: the VT100 personal office computing option.

Now you can turn one of the world's most widely used ASCII video terminals into your own personal office computer to run one of today's most popular operating systems: CP/M.®

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CP/M: THE DECADE'S FASTEST GROWING FAMILY OF SOFTWARE.

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Of course, the idea of personal computing isn't new to us. In fact, Digital pioneered the concept in the early 1960s when we developed interactive computing. And it's the basic principle behind every product we've ever produced.

That's why we originally designed the VT100 with enough power and space so you'd be able to turn it into a personal computer today. Like all the computers we've designed, it lets you get the information you want, in the form you want, when you want it.

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Digital's VT100 video terminal. It's half of the personal office computer you've been looking for.

Digital's personal office computing option comes with a Z80-based CPU, dual mini floppy drive standard (second dual floppy drive optional), diagnostic disk, user documentation and guide, and installation hardware.

To get the rest, contact your local Digital terminals distributor or your Digital sales office. For the name of your nearest distributor, call 1-800-258-1577. In New Hampshire, call 603-884-7492. In Canada, call 1-800-267-5250.

Digital Equipment Corporation, Terminals Product Group, MR2-2/M67, One Iron Way, Marlboro, MA 01752. In Europe: 12 Av. des Morgines, CH-1213 Petit-Lancy/Geneva, Tel. 011-41-22-93-33-11. In Canada: Digital Equipment of Canada, Ltd.

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MCI Slated to Buy Western Union International

WASHINGTON, D.C. — MCI Corp., which was on the verge of bankruptcy five years ago, has agreed in principle to buy Western Union International, Inc. (WUI) from Xerox Corp. for about $185 million. The Federal Communications Commission (FCC), which must approve the deal before it can be consumated, will need an estimated six months to decide.

MCI now operates the nation's second largest long-distance telephone network and 95% of its revenue comes from voice traffic. Acquiring WUI, the third largest U.S. international record carrier (IRC), will enable MCI to expand not only into international voice/data services, but also into domestic record communications offerings.

A substantial percentage of the latter business comes from international telex users in the U.S. who need domestic circuits to reach the end points of the IRC networks. Western Union Telegraph Co. has long been the monopoly supplier of domestic record services. (Western Union and Western Union International are independent companies.)

Xerox's decision to dispose of WUI marks the latest step in an apparent plan to disengage itself from telecommunication services. Earlier, the company abandoned Xten, a pioneering data communications system that permits end-to-end digital transmission at wideband rates. Largely because of Xten, the FCC reserved a band of frequencies for digital termination systems (DTS), and several applications proposing high-speed digital services based on DTS are now pending at the commission for resolution.

Xerox's last remaining investment in transmission is Ethernet, a scheme for interconnecting multiple, diverse terminal devices located relatively close together by means of a high bit rate, coaxial cable-based local-area network, a Xerox spokesman said, adding that the company remains totally committed to Ethernet.

New Companies

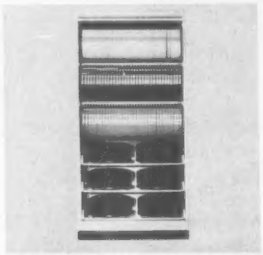
Former Century Data Systems, Inc. Vice-President Richard Charlton has established **Charlton Associates, Inc.**, a new company that specializes in the manufacturing of rigid magnetic disks. The firm can be reached through P.O. Box 18326, Irvine, Calif. 92713.

Deltak Systems, Inc. was recently created by Deltak, Inc. to translate Deltak's DP training programs into German and distribute them to West Germany, Switzerland and Austria. The firm is based at 1220 Kensington Road, Oak Brook, Ill. 60521.

Amcodyne, Inc. has been formed to develop OEM disk data storage products and is headquartered at 805 S. Lincoln St., Longmont, Colo. 80501.

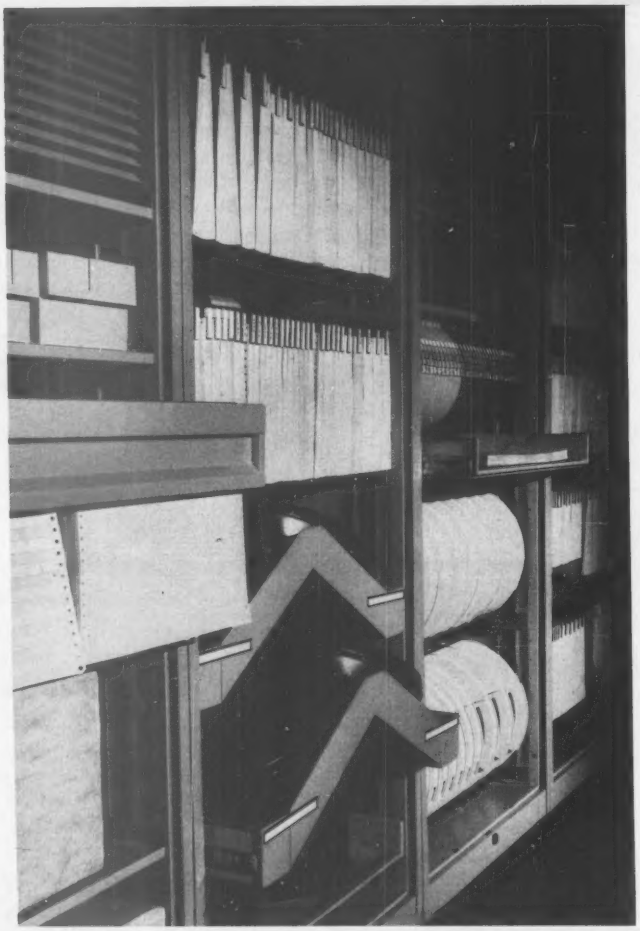
Fireman's Fund Insurance Co. has set up a separate subsidiary to develop and market agency automation systems and support systems. The new company is called **Agency Automation Services, Inc.** and is located at P.O. Box 3395, San Francisco, Calif. 94119.

1972 Bought first Optimedia cabinets to file remaining punch cards, 1316 disc packs and reels of 1600 BPI tape.



1975 Media changed to include 3336 packs in addition to tape. Cabinets reconfigured, new cabinets added.

1978 New system required 3348 disks but no tape. Manuals and run books added. Cabinets again adapted to needs.



1981 Optimedia usage has grown to include a wide variety of computer room media, systems and programming documentation and printout reports in all departments of the company. As media has changed, the Optimedia cabinets have been reconfigured to meet each new filing need.

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Canadian Officials Decry $125 Million CCI Loan Loss

OTTAWA — Some government officials here are decrying the estimated $125 million the provincial governments of Ottawa and Ontario stand to lose because of investments they have made over the last decade bailing out Consolidated Computer, Inc. (CCI).

CCI, a manufacturer of data entry equipment, has been walking on financial hot coals since the government began investing in the firm after it went bankrupt in 1971.

Between 1977 and 1979, it looked as though the company would return to economic good health as it began turning a small profit [CW, Jan. 22, 1979]. However, while CCI was showing some earnings, its leasing subsidiary, Financeco Ltd., was getting more heavily into debt.

At the end of 1979, CCI also experienced losses due to a softness in the market for new data entry equipment, similar to that experienced by Inforex, Inc., which eventually declared bankruptcy [CW, Dec. 3, 1979].

Inquiry Announced

In return for pumping money into CCI, the two Canadian provincial governments held about 65% ownership in the company. Late last November, government officials announced plans to open an inquiry into government backing for the computer firm because of the large losses associated with the government's investment.

Most of the investment reportedly has been in the form of loan guarantees for working capital, which were guaranteed at 100% of the loan amount.

By year-end the government had agreed to sell its interest in the ailing computer company to Nabu Manufacturing Corp. of Ottawa. Under the agreement, Nabu reportedly will pay less than $10 million for CCI. That company has agreed to provide enough working capital to keep CCI going for the next two years, according to Herbert Gray, minister of Federal Industry, Trade and Commerce. The agreement should be concluded by the middle of this month.

Judge Stops Bid To Halt Ban On Mail Sales

CUPERTINO, Calif. — A federal district court here has denied a request from six mail-order computer dealers for a preliminary injunction that would have stopped Apple Computer, Inc. from banning mail-order sales of its products.

The flap arose in November when Apple asked its U.S. and Canadian dealers to sign amended contracts that stipulated dealers would not sell Apple products through the mail.

In a letter accompanying the contract, Apple stated "mail order sales are neither suited to providing [the] consumer education that emerging markets require, nor are they structured to provide the consumer satisfaction that has been associated with the Apple name."

Those dealers who sell products by the mail, estimated to number between 75 and 150, charge Apple with trying to fix prices. These mail-order houses further contend they provide adequate service and education.

Currently, the suggested retail price for an Apple III is $3,495, but one mail-order dealer — Olympic Sales Co. in Los Angeles — reportedly has been selling the same system for $2,800, about 20% less than list price.

Apple contends that the elimination of mail-order sales is legal and has said it is ready to litigate the matter to the U.S. Supreme Court.

Index: Electronics Execs Needed

NEW YORK — Demand for executives in the electronics industry was 13% of total executive demand during the last quarter of 1981, about the same level as the third quarter, according to statistics recently released by Korn/Ferry International.

However, comparing 1980 and 1981 figures, demand for electronics executives increased 2%.

The increase in demand for executives was most noticeable in the East. "There is an overall demand for marketing executives and for executives in technology-related disciplines for office automation and for computer-aided design and manufacturing," according to Mark L. Tomchin, managing vice-president of the Korn/Ferry's High Technology Division.

Executive demand in the electronics industry was the second highest, trailing only the financial services industry, which accounted for 25% of executive demand.

The three categories of executives most in demand during 1981 were general managers (26% of total demand), finance officers (22%) and marketing directors (19%).

Nationally, senior executive hiring fell 11% last year from 1980's level, the first annual decline in the 10-year history of the Korn/Ferry index. Executive salaries gained only 7% to 9% during the year, the smallest growth in the past five years, the survey noted.

Distributed Data Processing

The Concept Has Changed!

Read about the changing face of DDP in Computerworld's February 22nd Special Report, "Distributed Data Processing."

Qualified DP/MIS people are expensive and hard to come by. Some companies are coping with this problem by changing the traditional concept of Distributed Data Processing. Functions requiring high-level DP skills are being recentralized, and easy to operate, less intelligent remote job terminals run by people without expensive, unnecessary qualifications are being put into the field. A central processor coordinates the network and performs the more difficult tasks. But, will cutting back on the "fancy functions in the field" really save you enough money? Edited by Tim Scannell and Tom Henkel, "Distributed Data Processing" will address this question as well as important issues such as:

- **Security:** its importance as traffic and networks increase. What approaches to DDP security have users found effective, and where have supposedly fail-safe systems failed?
- **Management aspects of DDP:** as the system grows, so do management problems.
- **DP Personnel:** bringing people up through the ranks vs. going outside to fill jobs.

Plus, we'll be taking a look at the DDP philosophical and marketing rivalry—attaching minicomputers to a host computer vs. eliminating the host in favor of a network of minis.

If you're a user who watches the trends, you'll want to have the most up-to-date information about DDP and you'll find it in our February 22nd Special Report. And if you're marketing products or services in the DP field, you'll want to make sure your ad is there. Ad close is February 5th. Contact your **Computerworld** salesperson, or call Frank Collins at (617) 879-0700.

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Nickels & Dimes

Computer Associates International, Inc. has made an initial public offering of 500,000 shares of common stock at $14/share.

$$$

The board of directors at **United Telecommunications, Inc.** has approved a 1982 capital expenditure program of $709 million for United Telecom companies.

$$$

E-Systems, Inc. authorized a two-for-one stock split of the company's common stock, subject to stockholder approval at a special meeting to be held Jan. 29.

$$$

Denelcor, Inc. has privately sold 300,000 shares of its common stock for $2.4 million to a European investor.

$$$

Mathematical Applications Group, Inc. announced the completion of a public offering of 89,500 shares of the company's common stock at $16.75/share, raising $1.3 million.

$$$

Startel Corp. has announced that a $1 million private stock placement has been completed with Citicorp Venture Capital Ltd., a subsidiary of Citicorp and E.M. Warburg, Pincus and Co. Concurrently, the Bank of America has afforded Startel Corp. a new line of credit.

$$$

Informatics, Inc. announced a 50% stock dividend to holders of the company's common stock. The dividend will be payable on Jan. 14 to shareholders of record on Dec. 21.

$$$

Dyson Corp. has made a public offering of 2.2 million shares of common stock at a price of $18/share.

$$$

Centronics Data Computer Corp. has executed a formal agreement restructuring the company's credit arrangements.

$$$

Plantronics, Inc. has acquired a minority equity interest in **Coastcom, Inc.**

$$$

AM International has entered into an amended $109 million U.S. revolving credit agreement with 20 participating banks and has resolved its noncompliance with certain covenants of the earlier deal.

$$$

Triad Systems Corp. has issued a public offering of 908,433 shares of its common stock at $35/share.

$$$

Informatics, Inc. announced a 50% stock dividend to holders of the company's common stock. The dividend will be distributed on Jan. 14 to shareholders of record on Dec. 21.

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Gandalf Technologies, Inc. announced its initial public offering of 2,170,000 common shares of stock at $10.25 each.

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Executive Corner

• Barry Fidelman has resigned as vice-president of Data General Corp.'s Information Systems Division and joined Apollo Computer, Inc. as vice-president of marketing.

• At Cylix Communications Network, James Ziegler has been promoted from president and chief executive officer to chairman of the board, a new post, and Ralph Johnson has been named president and chief executive officer.

• Joe Culp has been named president of telecommunications for Rockwell International's Commercial Electronics Operations.

• Ralph Lowry has been appointed vice-president of sales for Bytex Corp.

• Ted B. Westfall, former executive vice-president and director of ITT Corp., has been elected chief executive officer at Comdial Corp.

• Thomas L. Ringer has been appointed president and chief executive officer, and Garrett Fitzgibbons has been named executive vice-president at TRW-Fujitsu Co.

• Jerry Minsky has been named general partner of the Micro Office Technology Limited Partnership, a research and development tax-sheltered program that raises funds for the design of electronic workstations.

• John H. Crawford has been named vice-president and general manager of Data General Corp.'s Small Business Systems Division.

• University Computing Co. has appointed Michael G. Cocks as division vice-president of its European software operations, Software Products International.

• Patrick Rickard has been elected to the newly created position of vice-president of products development at NBI, Inc.

• James R. Barnes has been appointed vice-president of peripherals development at Data General Corp.

• Roger McKee has been promoted to vice-president of sales for the Implementation Systems Marketing Division of the Software Products Group at Informatics, Inc.

• H. Dan Fisk has been elected vice-president and associate Washington counsel at United Telecommunications, Inc.

• Donald Manzo has been promoted to vice-president of Imperial Data Resources, Inc.

• John Kulp has been named vice-president for research and development at Symbolics, Inc.

• F. William Siegrist has been promoted to the newly created position of vice-president in charge of solid-state circuits and ark electronics at Paradyne Corp.

• Nick Chargin has been named vice-president of marketing at SSY Systems, Inc.

• Jeff Kushan has been named vice-president of government relations for Southern Pacific Communications Co.

• Bernard Vonderschmitt, a former RCA Corp. employee, has joined Zilog, Inc. as vice-president and general manager of the firm's components division.

• Honeywell, Inc. has appointed Richard E. Weber to the post of corporate vice-president of administration.

• Robert Goldman has been appointed executive vice-president of Cullinane Database Systems, Inc.

• William R. Fitzgerald has been promoted to vice-president of programs in the Satellite Communications Division of Harris Corp.

• James S. Cockrum has joined Dataquest, Inc. as vice-president and director of the Telecommunications Industry Service.

• Donald Fluken has joined MicroPro International Corp. as vice-president of finance and administration.

Expansions

Raxco, Inc. has opened new corporate headquarters to house administrative, technical and marketing personnel at Suite 200, 6520 Powers Ferry Road, Atlanta, Ga. 30339.

Telxon Corp. has moved into a new corporate headquarters at 3330 W. Market St., Akron, Ohio 44313.

Genesis Software Corp. has relocated to 1408 140th Place N.E., Bellevue, Wash. 98007.

DBMS, Inc. has announced its move to new headquarters at 1801A Mill St., Naperville, Ill. 60540.

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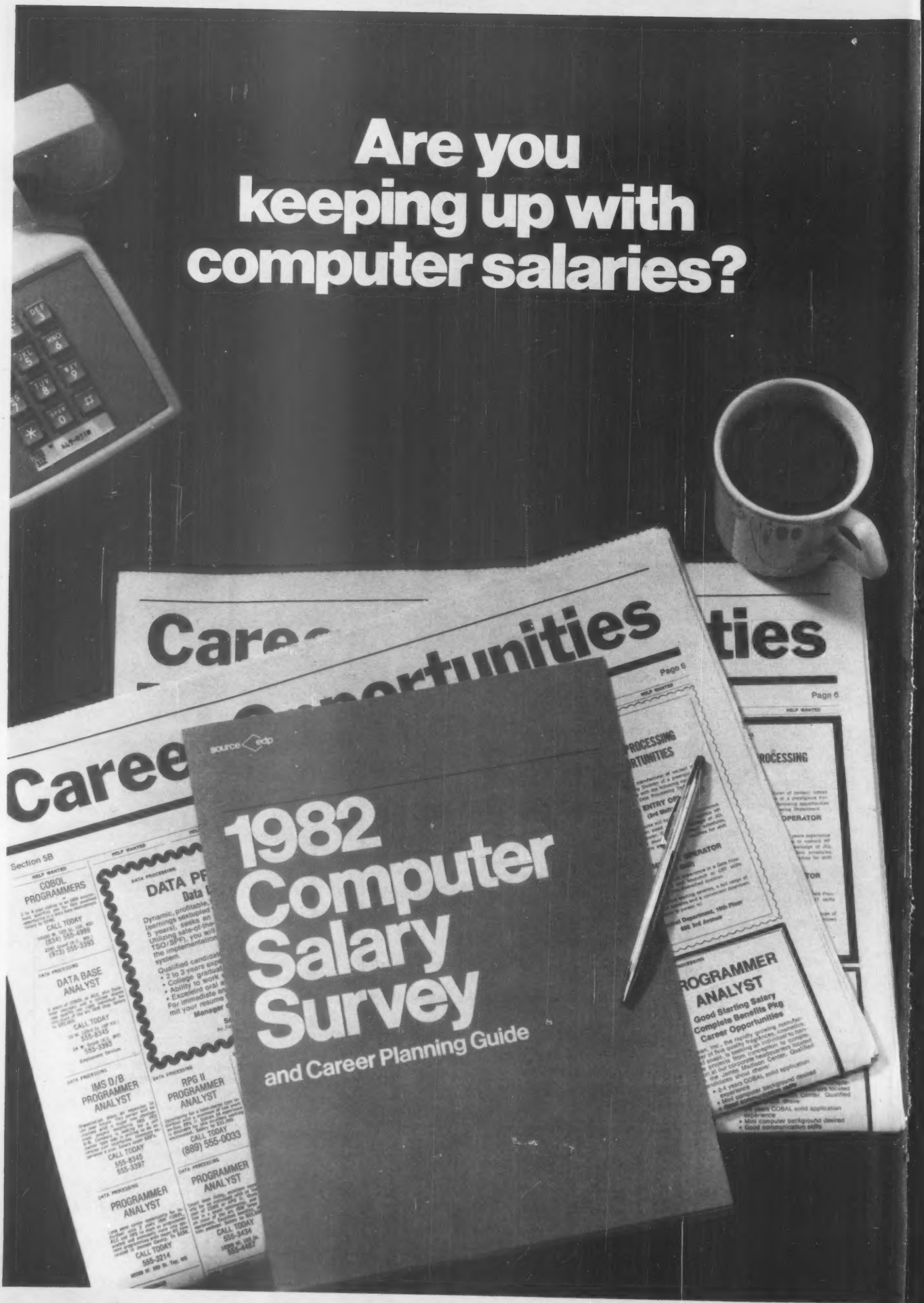
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1982 Computer Salary Survey
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Get the latest compensation data FREE in our new, 1982 Computer Salary Survey.

With compensation rising rapidly and sweeping technological changes occurring practically overnight in the computer profession, you can quickly become out-of-touch with salary and career trends. Are you—and is your salary—keeping up?

If you haven't kept in touch with computer salaries in the past six months or so, you might be surprised at the changes. Some computer salaries are soaring.

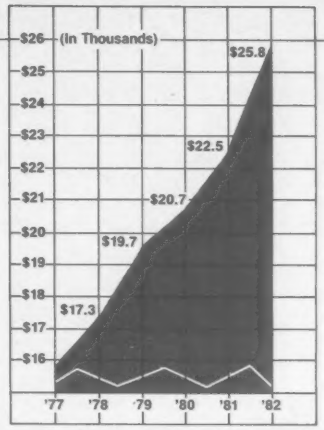
In our recent Survey, new statistics about compensation differences emerged. Here is a sampling:

- While some computer professionals have increased their salaries dramatically during the past twelve months, others, performing the same type of work and having the same general level of experience, have barely managed to keep pace.
- While length of experience in computing bears a direct relationship to compensation, type of experience is often more critical.
- Some emerging technologies—microcomputer systems, for example—are having an unusual impact on compensation.

Salaries for 48 positions are compared.

1982 salary data for 48 different position categories—at various levels of experience and computer installation sizes—are reviewed in the report. Included are positions in programming, software, systems design, data communications, mini/micro systems, data base, EDP auditing, computer marketing and more. At both technical and managerial levels. It's the most complete computer salary survey available.

In addition, the Survey provides information on ways that computer professionals can maximize their chances for "getting ahead" through a unique seven-step career management and planning system. In-depth strategies for long-term growth—based on almost 20 years of career research—are also reviewed.



Computer salaries are soaring. In our 1981 Survey, for instance, Systems Programmers with one-to-two years of experience earned a median income of $22,500. This year, a one-to-two year Systems Programmer will earn $3,300 more than that amount.

It's free to computer professionals.

The new *1982 Computer Salary Survey and Career Planning Guide* is available to you without charge. It's compiled and published annually by Source Edp, who interviews more than 50,000 professionals every year and represents 40,000 client organizations.

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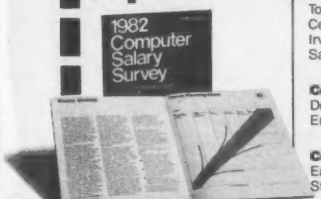

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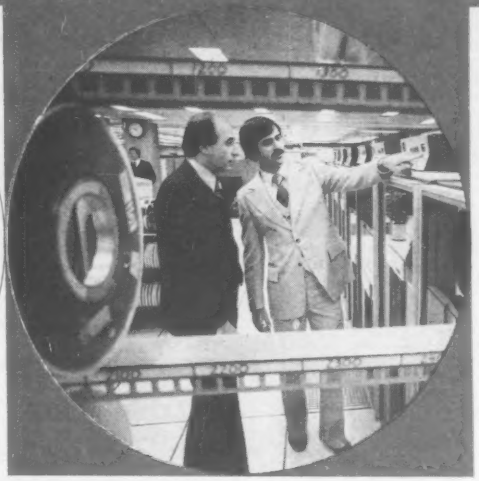

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Manager, Field Data Processing Facilities

You will be responsible for the Utah project data processing center. Duties will include program development, maintenance, and end-user interface. The successful candidate will have several years' mini-computer experience (Wang or H-P preferred) and be familiar with CPM network.

Boise home-office openings for professionals with design/construction engineering experience include:

Data Processing Coordinator
Engineering Programmer
Wang Programmer

At M-K, you'll find unparalleled professional growth opportunities. We offer a highly competitive salary and benefit package including company-paid medical and dental insurance, stock purchase plan, and relocation assistance with a one-month salary bonus. For more information, call or send your resume with salary history to:

Gary S. Hunt
Morrison-Knudsen Company, Inc.
Power Group TAD 0112
Two Morrison-Knudsen Plaza
Boise, Idaho 83729
TOLL FREE 800 635 5000

An Equal Opportunity Employer m/f/h

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COMPUTER PARK, P.O. BOX 623
HAMPTON, NEW HAMPSHIRE 03842
(603) 926-6712
A COMPONENT OF EXETER INTERNATIONAL, INC.

Site Maintenance Engineer
Data General Equipment

Compucare Corporation has an immediate opening in the Washington, DC area for an experienced hardware maintenance engineer to perform corrective and preventive maintenance on a variety of equipment. Experience with DG Nova or Eclipse computers, data media terminals, DEC Spinwriter or DEC writer printers, Printronix line printers, CDC disk drives, mag tape, and communications systems design. Familiarity with operating systems, or DOS or MUMPS a plus. Salary in low to mid $30's. Compucare offers an attractive compensation package including salary, company paid medical and dental for employee and dependents, and three weeks vacation. Relocation expenses paid. Call or send resume to:

Christine Chapman
Compucare Corp.
2133 Wisconsin Ave. NW
Washington, DC 20007
(202) 625-7754

Data Processing Manager

USE YOUR ABILITIES TO THEIR BEST ADVANTAGE

Combine your Data Processing career with the advantages of a 250-bed community hospital in one of Michigan's enjoyable locations.

Port Huron Hospital is currently seeking a Data Processing Manager who holds a Bachelor's degree in either Computer Science or Business Administration and has at least 3 years management experience. COBOL experience and/or systems design experience, plus some hospital data processing experience is preferred.

The hospital, located in the scenic Blue Water recreation area of Lake Huron, just an hour's drive from Detroit, offers a supportive and friendly environment where your contributions are quickly acknowledged. We offer salaries commensurate with experience and ability, and an excellent benefit package including:

Full family Blue Cross/Blue Shield and dental coverage, master medical, professional liability and long term disability coverage, tuition reimbursement, quarterly cost of living adjustment, paid vacations, holidays and sick time plus reimbursement and relocation assistance.

For more information and immediate consideration, call collect or send your resume with salary requirements to:

Employee Services
Port Huron Hospital
1001 Kearney Street
Port Huron, MI 48060
(313) 987-5000 Ext. 274

An Equal Opportunity Employer M/F

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Computer Sciences Corporation

Managers

Computer Sciences Corporation, world's largest information services company, is expanding its Los Angeles Data Center. A number of key management positions are available for experienced service bureau professionals:

Operations Manager
You will be responsible for the production operations at the Center including computer operations, data entry, data control, production, and distribution. The Center will ultimately have approximately 150 employees.

Programming Support
You will supervise a staff of programmers and technical support people to maintain a 7-day, 24-hour operation. Requires experience in programming in an IBM service bureau environment, preferably with a Cyborg system.

Customer Service
You will supervise a staff of customer service representatives who will set up new clients and respond to customer problems. Must have payroll customer service experience.

Administration
Supervise a small staff responsible for administrative support activities including accounting, budgets and facilities.

Tax Reporting
You will supervise a staff of clerical employees responsible for payroll tax reporting for our clients.

We offer attractive salaries, growth opportunities and a benefits program, including medical/dental insurance, stock purchase, tuition reimbursement, and more. For immediate consideration, send resume or call **Rolfe Schroeder (213) 615-0311 Ext. 2230.**

CSC
BUSINESS SERVICES DIVISION
650 N. Sepulveda Blvd.
El Segundo, CA 90245
An Equal Opportunity Employer M/F/H

SOFTWARE ARCHITECTURE

Our client, a Los Angeles based, major systems software firm, seeks a SENIOR MANAGER to develop a large communications network.

You will be responsible for a team of computer scientists designing architecture for an on-line, real time transaction-oriented system. You should possess expertise in the design of a large-scale, mulitple release, software system such as ticketing, reservations, financial transactions, and/or information network systems - especially in a distributed mini-communications network environment.

Compensation package in the MID $70's.

Send resume with salary history or call (213) 277-7421

Genovese & Co.
Management Consultants, Executive Search
1880 Century Park East
Los Angeles, Ca. 90067

DATA PROCESSING PLANNING AND SYSTEMS DEVELOPMENT

Growth and demand for DP Services at AOP has created a career opportunity for Data Processing and Systems Analysis Professionals. Candidates should possess a college degree in information systems or related discipline. An advanced degree is desirable. Technical skills should include proven abilities and experience in the following areas:

ON LINE SYSTEMS • DATA BASE SYSTEMS
PROJECT PLANNING AND MANAGEMENT
IBM SYSTEMS

Experience in oil and gas accounting is desirable. Please send resume to:

AMERICAN QUASAR PETROLEUM CO.
Personnel Dept.
2500 Ft. Worth
National Bank Bldg.
Ft. Worth, 76102
equal opportunity employer

EDP OPPORTUNITIES COAST TO COAST

Robert Half, staffed by EDP professionals for EDP professionals with 70 offices throughout the U.S., Canada & Great Britain, is the largest network of personnel consultants in the Data Processing field. And its establishment in 1948 also makes Robert Half the oldest. One call and you can search the local, national and international markets. All fees are paid by client companies, of course. The following is a partial listing of opportunities and locations:

ST. LOUIS

MARKETING REPRESENTATIVE
Looking for an exciting geographical change? Prestigious manufacturing co home-based in St. Louis has positions available on East and West coasts and in between for exp and degreed DP sales/marketing "pro". Strong desire and ability for a career in sales mgmt with good interface and communication skills required. To $35,000

PROGRAMMER/ANALYSTS
We have several "career-type" positions available for experienced professionals with COBOL or RPGII background. Various hardware includes Burroughs, Wang, Tandem and med to lg IBM. Economically secure and growing companies. To $30,000

DIRECTOR OF SYSTEMS DEVELOPMENT
International DP and Telecommunication operation offers an exceptional opportunity for an individual ready to take the responsibility for all Real Time application development activities. Must be a management generalist with 10 years systems development and project leadership exp. Bachelors degree required, MBA a definite plus. Salary over $35,000

TELECOMMUNICATIONS SOFTWARE SPECIALIST
A state-of-the-art division of a billion dollar corporation has an immediate need for telecommunication software experts. A strong background in an IBM SNA environment is preferred. Requires 2 years of BAL experience. Heavy exposure to VTAM, BTAM, or TCAM systems design is required. Salary to $34,000

Delores Cook
Randy Pace
ROBERT HALF
of St. Louis
7733 Forsyth Blvd.
St. Louis, MO 63105
(314) 727-1535

NEW ORLEANS

PROJECT MANAGER
Five plus yrs in large systems as lead analyst or project mgr. Retail or distribution exp helpful. To $32,000

SYSTEMS GROUP MANAGER
Must have banking exp using COBOL. IPs helpful. To $35,000

SYSTEMS PROGRAMMER
Aggressive retailer. Must have DMS/DB/DC. Co. going to Amdahl. To $40,000

DP MANAGER
Regional manufacturer needs hands-on Sys 38 exp. MAPICS is a plus. From $30,000

ROBERT HALF
of Louisiana, Inc.
4630 One Shell Square
New Orleans, LA 70139
(504) 524-3773

GREENSBORO

PROG/ANAL
Leading SE bank has need for OS, BAL or COBOL — CICS a plus hardware imp. To $26,000

PROGRAMMERS
2 yrs OS & COBOL reqd for excellent mfg co super growth potential in a state-of-the-arts shop. To $22,000

PROG/ANAL
Savings & loan bkgd, 2 yrs COBOL and MVS reqd for new company unlimited growth pntl. To $25,000

Larry Brooks
ROBERT HALF
of North Carolina, Inc.
Wachovia Bldg., Suite 1117
Greensboro, NC 27401
(919) 274-2448

PHOENIX

SR SYSTEMS SOFTWARE SPEC
Rapidly expanding Phoenix based Corp seeks an IMS DB/DC specialist to support a large information system development project. OS/MVS, assembler, JCL and IMS systems programming desired. Starting salary to $28,000

Roc Rogers
ROBERT HALF
of Phoenix
3550 N Central, Ste 1504
Phoenix, AZ 85012
(602) 264-6488

CHICAGO

DATA BASE ANALYST
Prominent corporation is going through major conversion from IDMS to IMS DBDC. Excellent opportunity to gain experience in two widely used data bases in one shop. Company offers excellent benefits and location. $32,000

PROJECT DIRECTOR
Fortune 500 company has need for financial and /or insurance background. Responsibilities include project mgmt, new on-line development and budgets. Position offers high visibility and good career path. Pluses are Life 70, CFO or ABC package exposure. $42,000

George Thomas
Sandy White
ROBERT HALF
of Chicago, Inc.
35 E. Wacker
Chicago, IL 60601
(312) 782-6930

WASHINGTON

Excel mfr in Blue Ridge Mts 1½ hrs from DC seeks Sr Programmer w/COBOL/JCL exper. Great bens/long vacations. $25,000

ROBERT HALF
of Washington
7316 Wisconsin Avenue
Washington, DC 20014
(301) 652-1960

HOUSTON

SR PROGRAMMER ANALYST
Design & programming exp on IBM OS equip. IMS/CICS a plus. Fin/Acct — MSA. Salary to Low $30's

IMS DATA BASE ANALYST
IBM Data Dictionary implementation and administration — Large energy Co. Degree required. Salary to Mid $30's +

BUSINESS SYSTEMS ANALYSTS
Heavy exp with A/R systems — revolving credit — credit card systems. Prefer IBM OS COBOL exp. Salary to Upper $30's

SR ANALYSTS
Life insurance design and development — 3+ years IBM OS exp. Salary to Upper $30's

PROGRAMMER ANALYSTS
Assembler language/COBOL IBM DOS-OS. On-line Acct applications. DL/1 — DMS a plus. Salary to Low $30's

SYSTEMS PROGRAMMER
VTAM/ACF — OS/MVS gens and maintenance. Tuning and programmer consultation. Large energy Co. Salary to $40,000+

Plus other more technical positions. All interviews, relocations & fees are paid by the client Company.

Jim Fleming
ROBERT HALF
of Houston, Inc.
720 North Post Oak Road, #228
Houston, TX 77024
(713) 688-1800

COLUMBUS

MGR OF SYSTEMS DEVELOPMENT
Manage development of application software. Will design and support writing of Financial related programs. Must have 6-8 years PDP 11-RSTSE exp. Familiarity with CTS 300, CTS 500 and DIBOL necessary. Excellent benefits. Salary $25-35,000

SYSTEMS PROGRAMMER (OS)
A growing and expanding shop needs a systems expert. Must have 2 yrs experience with IBM 4331, OS-VS-1, CICS Telecom, COBOL and Assembler. Complete benefits and relocation. Salary $24-27,000

DP TECH SUPPORT SPECIALIST
Be responsible for Hardware and Software evaluation, System generation and telecommunications. Must have 6 years System Programmer exp, Assembler, IBM-OS, DBMS, IDMS, IMS-DL1, Environ, and Total. Bridge loan & buy out. Southern location. Salary $28-34,000

Kurt Hopwood
ROBERT HALF
of Columbus, Inc.
85 East Broad St., Suite 1150
Columbus, OH 43215
(614) 221-9300

BOSTON

EDP AUDIT MGR.
Prominent Boston bank seeks take charge indiv to manage EDP audit staff of 4. Large-scale IBM OS+ minis environ. Oppty to be first mgr of this hi-visibility team. $40,000

IMS/COBOL P/A
Fortune 500 firms seeks results-oriented programmer/analyst for new devel projs. IBM OS/MVS, IMS-DBDC environ. Oppty for move up to analyst in growing org. $27,000

CICS/COBOL
Prestigious svcs firm seeks innovative analyst for conversion effort. IBM 4331 DOS/VSE, COBOL, CICS environ. Long-term oppty to move to OS/MVS on 3033's within same co. $25,000

INSURANCE SYS. DESIGNER
Well-estab service bureau seeks sr analyst for new sys design. Bkgrd should incl P&C sys on IBM hardware. Will play major role in new prod development. $30,000

ADABAS SPECIALIST
Leading educational inst seeks ambitious task-oriented COBOL P/A for on-line devel projs. IBM OS environ with structured methodology. Outstanding benefits pkg to incl 4 wks vac 1st yr. $27,000

BANKING SYSTEMS
Major comm'l bank seeks systems pro for analysis of future hardware/software req's incl office automation/data processing. Will develop 5 yr plan for this IBM OS shop. Oppty to interact with high levels of mgmt. $40,000

Gerry Battista
ROBERT HALF
of Boston, Inc.
100 Summer Street
Boston, MA 02110
(617) 423-1200

PROVIDENCE

CORPORATE MIS
Prominent capital equipt mfr seeks systems prof to manage corp MIS. Expertise in CAD/CAM, Robotic apps & numerical control highly desirable. Must have ability to communicate with all mgmt levels. Salary mid $30's

BUSINESS SYSTEMS ANALYST
So Mass mfg firm has immed need for take-charge indiv to implement co wide DP capabilities from the install of DP hardware/software prods. Sm to med size on-line computer environ exp desired. Salary to $30,000

DOS SYSTEMS PROGRAMMER
Provide systems support in IBM 4341/370 DOS/VSE environ. CIS/TOTAL expertise desired. Strong COBOL & Assembler skills necessary. Salary to $30,000

FIN'L PROG/ANALYST
Maj fin'l inst has aggressive sys devel plans for '82. Excellent growth oppty for sr programmer analyst with solid COBOL bkgrd. Proj mgmt resp. Salary to $26,000

SYSTEMS ANALYST
Lge scale sys design & implem exp req for IBM state-of-the-art environ. Project planning/coordination with user & DP resources. Prior programming bkgrd req. Salary to $25,000

Bob Lathrop
ROBERT HALF
of Providence, Inc.
400 Turks Head Bldg.
Providence, RI 02903
(401) 274-8700

ROBERT HALF

HARTFORD

SYST PLANNER

Growth-oppty for indiv with life or group pensions design bkgrd to move into career path leading to sr mgmt resp's.
Starting salary to $34,000 +

DATA BASE

CT oppty's for CICS or IMS trained indiv's to become part of new dev proj in rural setting. Full relocation with salaries to $34,000

ASSEMBLER PROG'S

Min 2 yrs exp with IBM systems qualifies for systems oppty's providing tech support for on-line projects.
Salaries to $30,000 +

EDP AUDITOR

Major Fortune 500 corp seeks EDP auditor to assume full resp for major systems implementations. Excellent visibility. Cent CT location. Salary to $28,000

SOFTWARE ENGINEER

Northern NE oppty for CAM engineer exp'd in mfg machine tool control software. Full relocation. Excellent benefits.
Salary to $39,000

PROJECT MANAGER

Major CT insurer seeks seasoned pro expert in project mgmt, distributed systems, & office of the future technologies. Salary to $35,000

Stan Durbas
Carol Wilson
ROBERT HALF
of Hartford, Inc.
111 Pearl Street
Hartford, CT 06103
(203) 278-7170

ATLANTA

SYSTEMS PROGRAMMER

Excellent company extending advancement opportunity for career-minded person with degree and 3 plus years comprehensive technical experience on large IBM's/MVS. BAL skills, CICS support, knowledge of MVS internals including JES 2, VTAM, TSO/SPF helpful. High $30's

DATA COMMUNICATIONS SPECIALIST

This specialized position requires heavy experience on UNIVAC 1100-10, 40, 60, 80. The ideal candidate should have 2 or more years data communications experience. OS, CMS, VCP, or GES. Salary negotiable for good fit. $30,000 +

SYSTEMS SOFTWARE TECH

Great opportunity with this large company looking for degree with 3 plus years experience of which 2 to 4 are in system software development. MVS internals, telecommunications experience, VTAM, NCP. Languages: COBOL and/or PL1. Operating systems: CICS, OS/VS. Low $30's

Norma Rayburn
ROBERT HALF
of Atlanta, Inc.
3379 Peachtree Rd. N.E.
P.O. Box 10201
Atlanta, GA 30319
(404) 266-2153

SEATTLE

PROG/ANALYST

Alaska IBM 3031 OS/MVS shop seeks someone with 5 years experience with Assembler and some COBOL. To $32,000 plus relocation and good benefits.

Ray Magill
ROBERT HALF
of Seattle, Inc.
600 University St.
Suite #2328
Seattle, WA 98101
(206) 624-9000

BUFFALO

SYSTEMS ANALYST

Hvy user liaison resp for this corp level pos. Bkgrd should be up thru the ranks from prog to design & implem. Emphasis on fin'l or mfg sys the key. Sophisticated IBM 370, PL1, IMS install. $33,000

SOFTWARE SYS PROG

Major Univac to IBM conversion pres taking place in div of industrial mfg co. Career progression from apps to software is perfect. Tech exp with ALC or BAL, IMS/CICS networking, OS/MVS sys generation. Degree pref for start-up pos. $34,000

SR PROG ANALYST

Pos avail for plants on NY/PA line & in Midwest. Lge scale mainframe, pref IBM + min 3 yrs COBOL prog exp req. Bkgrd must incl CICS or DL1. Resp incl sys develop & modification + testing. $30,000

ASST DP MANAGER

Expansion pos for not-for-profit co loc in Rochester. Comb of min 2 yrs supvry exp + tech expertise in on-line environ best fit. Must be able to back up mgr with admin resp + users & sys design efforts. $28,000

PROJECT ANALYST

Wholly owned sub of CNY mfg co implem automated sys. Sm to med scale hardware bkgrd for start up situation. Resp for develop & design of user sys req excellent comm skills. Pos dictates wearing many hats. COBOL a must. $28,000

Pam Siegal
Bob Collins
ROBERT HALF
of Buffalo, Inc.
1310 Liberty Bank Bldg.
Buffalo, NY 14202
(716) 842-0801

TAMPA

SYS PROG

Intl corp has multiple openings for VM or MVS exp Sysgens.
To $40,000

PROG/ANAL

Multiple openings for exp DOS/VS — COBOL — VSAM — CICS — any Database a plus.
To $24,000

PROG/ANAL

Banking — any application loans — DDA — or you name it DOS or OS — COBOL on line.
To $25,000

Stan Allen
ROBERT HALF
of Tampa, Inc.
1311 North Westshore Blvd.
Tampa, FL 33607
(813) 876-4191

MILWAUKEE

SYSTEMS PROGRAMMER MANAGER

Talents need a new challenge? If you have management potential, your 4+ years experience in a CICS environment could secure this position. DOS a plus. $31,000

SYSTEMS SOFTWARE ANALYST

Ready to roll up your sleeves and come to a shop where the challenges and rewards are equally great? International manufacturing Milwaukee office desires MVS SYS GENS experience. You'll need several years BAL, COBOL and CICS for this solid spot. $35,000

ROBERT HALF
of Wisconsin
777 E. Wisconsin Ave.
Milwaukee, WI 53202
(414) 271-HALF (271-4253)

NASHVILLE

OPERATIONS MANAGER

Billion $ Institution needs someone to handle operations in a multiple CPU Environment and handle tech support for OS/VSI or MVS. Teleprocessing + Must have supervised 60-150 people and had budgetary responsibilities of $5 Million. To $35,000

DP MANAGER

Middle TN manufacturing company needs "hands on" manager for their Systems 38 shop. No prior 38 experience necessary. Must have good manufacturing experience and be user oriented. Division of Fortune 500 Company with an excellent career path!
Mid $30's

SR ANALYST

Automobile Industry experience needed! If you have 4 years design experience on any large IBM mainframe in the auto industry, we have a stable position for you. No layoffs here! To $30,000

ROBERT HALF
of Nashville, Inc.
1101 Kermit Dr., Suite 407
Nashville, TN 37217
(615) 361-4900

DAYTON

QUALITY ASSURANCE MANAGER & SYSTEMS PROGRAMMER

IBM 4341 shop, soon to install MVS, seeks talented sys prog with strong COBOL & ASSEMBLER skills. Indiv with good OS systems bkgrd, data base (IDMS, D1/1, or IMS), Shadow II or CICS is ideal candidate. Tech support to programming staff. Highly visible key position with long term management growth potential.
$30-35,000

OPERATIONS ANALYSTS

Unique oppty to combine operations knowledge and systems analysis exp. Do you...
— Have the ability to review operation procedures and recommend improvements?
— Have Statistical Analysis (SAS)?
— Have knowledge of COBOL, Quikjob, TSO and/or CICS?
— Understand analysis of run time/utilization and have know-how to make performance improvement, re: programs and scheduling?
$25-28,000

IMS PROGRAMMERS

Two local IBM state-of-the-art 303X shops seek creative COBOL programmers with these skills:
— IMS DB/DC
— OS
— CICS
— ASSEMBLER

LEAD P/A: Requires prev IMS prog exp, BS degree, COBOL & ASSEMBLER, solid DB skills. $25-26,000

SENIOR P/A: 4+ years COBOL, strong IMS skills, DB/DC a +. $25-29,000

PROG/ANALYST: 3-7 yrs DP exp, 2-5 yrs ON-LINE DB/DC prog exp, COBOL, Data Dictionary a+. $21-25,000

PROGRAMMER: 1-2 yrs COBOL, entry level must have On-Line exp, IMS, DB/DC a+. $16.5-19,000

Susan Robinson
ROBERT HALF
of Dayton, Inc.
First National Plaza
Dayton, OH 45402
(513) 224-0800

AUSTIN

SOFTWARE PROGRAMMER

Degree not required with experience to compensate — IBM shop — DOS/VSE. Shop wants to become "state-of-the-art" in the next 18 mos. Converting from 370/148 to 43XX also. Excellent growth and benefits with growing company. $Open

PROGRAMMER/ANALYST

Good application skills with screen design and layout-format ability a MUST. Heavy work-load with excellent earnings/growth potential. Analyst ability will get you more money and promotion. NCR Centurian shop. $17-20,000

JR/SR TECH WRITER

Degree in related field. Good oral and written skills a MUST with software related ability a PLUS. Will do rewrite as well as new systems work for either position. Both levels are for a visible/fast track company.
$20-30,000

SR SYSTEMS ANALYST

Degree preferred not required. Manuf exp a MUST with 2 yrs plus exposure to Chain Store System. Start up situation with DOS/VS/4331 etc. • Position will lead to top slot within 12 Months. • (Network of 225 Stores to be automated.)
$28-32,000

All positions above and many more are in Texas, where "Long Necks", "Armadillos" and the "Cotton Eyed Joe" call home.

ROBERT HALF
of Austin, Inc.
Champion Tower
400 East Anderson Lane
Suite #334
Austin, Texas 78752
(512) 835-0883

JACKSONVILLE

SR PROG/ANALYSTS - SR SYSTEMS/ANALYSTS

Due to expansion, a major corporation based in Jacksonville has several openings in their data processing dept. Qualifications must include 3+ yrs OS/MVS, data base, preferable IMS. Candidates must also be proficient in either COBOL, ASSEMBLER or PL1. In addition a background in user interface and leadership abilities is desired. Excellent reloc and benefit package. Fee paid by management.
Salary $25-40,000

Doug Cook
ROBERT HALF
of Jacksonville, Inc.
9550 Regency Square Blvd.
Suite 213
Jacksonville, FL 32211
(904) 721-0970

DALLAS

PROGRAMMER ANALYST

Company with an impressive record of growth supporting the oil & gas industry needs people with two yrs IBM DOS/CS COBOL programming ability. CICS is a plus. To $27,000

SYSTEMS CONSULTANTS

Leading company supplying DP services to the insurance industry looking for a few take charge individuals. Will help install and modify systems. Requires 5 yrs insurance and IBM ALC programming background. To $35,000

John Staiger
ROBERT HALF
of Dallas, Inc.
Two NorthPark East, #750
Dallas, TX 75231
214 363-3300

SAN ANTONIO

DP MANAGER

5+ yrs in DP with good overall appl skills. Job is shirt sleeve shop, IBM 34, RPGII environment. This position reports to VP and is responsible for the growth of dept. $25-30,000

PROGRAMMER ANALYST

BS in related subjects. Good COBOL skills a MUST. Position is in high visibility dept and will advance if you are of the nature. No limit — IBM environment. $18-26,000

PROGRAMMER

Degree preferred not required. 2+ yrs COBOL exposure with I/L, C/L appl (banking) exp a MUST. Burroughs shop but any hardware accepted. Will lead to senior level in 12-18 mos.
$18-25,000

SCIENTIFIC PROGRAMMER

Degree in related subjects, ie, math, physics, CS, BDS. Fortran, Pascal, Assembler, TSS, Graphics, Tenex, Unex, CDC, System, & Tops 10/20. Good growth and visibility.
$28-40,000

All positions above and many more are in Texas, where "Long Necks," "Armadillos" and the "Cotton Eyed Joe" call home.

Bob Baldauf
ROBERT HALF
of San Antonio, Inc.
First International Bank Tower
Suite #850
San Antonio, TX 78201
1-800-531-5402
In Texas Dial (512) 736-2467

MEMPHIS

PROGRAMMER ANALYST

CICS inventory and mfg bkgrd. IBM 4300 co just starting up. Position must be filled by Feb '82. To $30,000

SYSTEMS ANALYST

New facilities, lge scale hardware. On-line systems development in COBOL. Degree preferred. Excellent reloc & fringes.
To $30,000

DATA PROCESSING MGR

IBM System 34 converting to System 38. Degree preferred. Manager of 8 people.
To $34,000

Judy Gurley
ROBERT HALF
of Memphis, Inc.
825 Ridge Lake Blvd.
Memphis, TN 38119
(901) 683-5834

DENVER

DATA CENTER MANAGER

National energy company offers challenging position for degreed individual with 4 years oil & gas background. Must have IBM experience & COBOL skills. Responsible for start up operation of in-house computer facility in Denver. Excellent career opportunity.
Start $40,000 range

SR ANALYST

Major Denver high technology manufacturing firm is seeking to hire a high level analyst with growth potential. Degree in computer science plus 3 yrs exp is req'd. Experience in REALTIME processing, RSXII operations and MACROII ASSEMBLER will give you the inside track on this excellent opportunity. Start $35,000 range plus relocation expenses.

ROBERT HALF
of Denver
2 Park Central, Suite 747
1515 Arapahoe St.,
Denver, CO 80202
(303) 629-1010

NEW YORK

BAL 4341 APPLICATIONS

Potential for significant career growth with this multibillion dollar conglomerate. 4+ years DOS BAL programming. COBOL programming and/or teleprocessing experience is a definite plus. Responsibilities include development of an ON-LINE trading system using IDMS. No ceiling on dollar potential. Benefits include outstanding bonus. $36,000

MINI FORTRAN

Unlimited growth potential for technically oriented pro. 3+ years FORTRAN programming, FINANCIAL applications exp and the desire to learn COBOL. Responsibilities include documentation of current system for new PRIME 750 mini using COBOL in an ON-LINE environment. Co will train in use of COBOL. $30,000

COBOL 158 & 4341

Assume key responsibilities in this rapidly expanding environment. 5+ years COBOL programming with strong DOS JCL experience. ON-LINE experience is a plus. Aid in conversion from batch to ON-LINE. An excellent upper-level position which will have impact on future of installation. $35,000

PASCAL BIG 8 CPA

Unlimited growth potential with this world renowned firm. 1+ years MICRO computer experience and PASCAL programming, with good oral and written communications skills. Audit or accounting experience is a plus. Aid in installation of personal computers in office environment. $26,000

DP MGR MICRODATA

Exceptional upper level position reports to the chairman of the board. 2+ years BASIC programming with strong design and implementation experience and MICRODATA REALITY mini in background. Responsibilities include supervision of seven in interactive environment. Comprehensive benefits. $35,000

RPG II SYS 38 & 34

Firmly established in its field this company has a remarkable history of growth and accomplishment. 2+ years RPG II programming and SYSTEM 34 experience. Will be responsible for implementation of commercial applications in multi computer environment. Company will train on installed SYSTEM 38. $28,000

Martin Amato
ROBERT HALF
of New York, Inc.
522 Fifth Avenue
New York, NY 10036
(212) 221-6500

ORLANDO

PROG/ANAL

Multiple openings for Sys 34 RPGII exp — mfg & general acctg applications. To $26,000

SYSTEMS ANALYST

Fortune 500 Co seeks 3+ yrs exp on minis — HP 3000 or prime is best. To $32,000

MANAGER

Major mfr wants prior supr exp with large IBM hdwe — CICS DL1/OS a must. To $32,000

Pam Evans
ROBERT HALF
of Orlando
2899 Lee Road, Suite 415
Orlando, FL 32860
(305) 628-2836

The revolving door isn't the only way to the top.

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We're the Federal Reserve Bank of San Francisco. Some people still think we're a branch of the Government. We're not. We're the bank for all depository institutions. We move billions of dollars and volumes of financial information through a national system every day. We have the perspective—and resources—to keep your career moving. And we've taken your personal style into consideration by providing career paths into both the management and technical areas. Both areas will give you opportunity for further raises and promotions.

We have two IBM 370/158s, MP and 3033 under OS/MVS, with IMS DB/DC. Our software tools include TSO/SPF, SNA, ACF/VTAM. We use COBOL for applications and ALC for systems.

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We have immediate opportunities for Programmer/Analysts, Project Managers, Systems Programmers, DBAs, and operations professionals. Your background should include at least two years DP experience in a compatible environment.

You don't need a "revolving door" to get ahead anymore. Please send your resume to The Federal Reserve Bank, Attn: Dawn Block, DP Recruiter, P.O. Box 7702, San Francisco, CA 94120. (Telephone 415/544-2041). We are an equal opportunity employer.

Federal Reserve Bank of San Francisco

COMPUTER GRAPHICS SPECIALIST

SOHIO's massive energy development plans have resulted in an explosive growth in highly sophisticated graphics applications and created the need for this high exposure position.

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- You will be involved with a task force that will determine SOHIO's present and future graphics requirements and develop hardware/software acquisition plans to support these requirements.
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Your requirements for this position are:

- Four to five years of proven experience with a variety of computer graphics terminals and software, preferably petroleum engineering or exploration related.
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- Preferably an MS in Computer Science (or related technical area).

Ideally your experience should include work on CDC Cybers operating under NOS.

An attractive salary, generous benefits, and advancement possibilities complement this responsible position. **Sohio's relocation package for new hires who are homeowners includes a mortgage interest differential allowance, third party home purchase option and other features normally restricted to internal transfers.** There's no better time to JOIN SOHIO than NOW! For immediate, confidential consideration, send your resume and salary history/requirements to:

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SOHIO

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The engineered treatment and control of industrial and commercial water, waste water and process systems is our business. With over fifty-five years of experience, Betz Laboratories is an international technological leader in the water treatment industry today.

As a result of our continued growth we are expanding our programs in the areas of laboratory automation, data management and computer support for our R/D staff. This has created opportunities for creative individuals possessing a scientific/computer background to become involved in some of our state of the art systems. Opportunities exist in the following areas:

MINI COMPUTER SYSTEMS

This position is to provide computer support for our laboratory in Houston, Texas. Specific responsibilities include management of our PDP 11/44 and 11/34 computers, the design and development of laboratory automation systems and scientific programming support for the R/D Staff. The ideal candidate would have degrees in Chemistry and/or Computer Science, and 3-5 years of scientific programming experience at the systems analyst level or above. Extensive experience with the RSX/11M operating system and proficiency in FORTRAN is also essential. Experience with chemical information/computer science applications, design and analysis of experiments and/or instrumental interfacing would be a plus.

SYSTEMS ANALYST

In this position you will provide technical support for our laboratory in Trevose, Pa. Responsibilities include a wide range of applications including development of database systems, interactive programs, interfacing our laboratory instruments to a computer network, as well as programs which support our current and future research projects. These programs utilize our computer network which joins a VAX 11/780 to our 11/80, 11/44 and 11/34 computers. The ideal candidate should possess a degree in Chemistry or Computer Science with 3-5 years of scientific programming experience at the systems analyst level or above. Experience with state of the art chemical information/computer science applications is a plus as is experience in the design and analysis of experiments. Proficiency in FORTRAN is essential as is a working knowledge of commercial data base systems such as DRS, ADABAS, SYSTEM-2000 etc.

Betz Laboratories offers a competitive salary, and comprehensive company paid benefit program. If you are seeking a challenging career position with the opportunity to interface with all levels of scientific personnel, please forward your resume (must include present compensation) to:

BETZ

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Manager, Professional Employment

Betz Laboratories, Inc.
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Trevose, Pa. 19047

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Systems analyst/ programmer

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Ground floor opportunity to develop and maintain a brand-new corporate MIS.

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A relaxed, yet challenging environment and excellent benefits package, including Master Medical, profit sharing, bonus, vacation days and tuition reimbursement.

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Lakewood, Colorado 80228
(303) 986-9561

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Contact: Bets Blatchley
2345 N. Academy Blvd., Suite 201
Colorado Springs, Colorado 80909-1596
(303) 574-3400

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Sally King, CPC
4101 McEwen, Suite 450
Dallas, Texas 75234
(214) 387-4801

CAREERS UNLIMITED, INC.
Contact: Pat DeCeseo
2248 East Mt. Hope Road
Okemos, Michigan 48864
(517) 349-4600

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DATA PROCESSING MANAGER

New Mexico based firm requires individual with experience in system resource planning and management, telecommunications, and general data center operations and software development management skills in rapid growth environment. Must be capable of effective oral and written communication skills and be responsive to top corporate management. Strong background in system design, programming, financial application and distributed processing required. Univac or other mainframe experience necessary.

Excellent compensation and benefits await qualified candidate. Please submit resume, including salary history and career objectives, to:

CW-A3155
Computerworld
Box 880
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To staff our new systems program we are seeking achievement oriented individuals with the following skills:

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We are seeking project managers to direct development teams of 3-5 programmer/analysts as well as consulting staff. Candidates must have successfully implemented either an international funds transfer/payment products system, or a trade finance/letter of credit system. In addition, they must have working knowledge of IBM 34 or 38, RPG or COBOL, and good presentation skills. Working knowledge in any of the following areas would be a plus: SWIFT, IBM Series One, IBM 4300, and micro/personal computers.

SENIOR PROGRAMMER ANALYSTS

We are seeking senior programmer analysts to join us in developing a variety of international banking applications. Candidates must have a minimum of three years experience in the design of on-line applications using either COBOL or RPG, and have good communications skills. Knowledge of WANG and IBM 34/38 equipment and banking applications is desirable.

PROGRAMMERS

We are seeking programmers with a minimum of two years experience in COBOL, BASIC or RPG. Working knowledge of WANG and IBM 34/38 a plus.

DATA BASE ANALYSTS

We are seeking data base analysts with at least three years experience in the design, development and security of shared, integrated, on-line data bases, and with prior experience in programming. Working experience with IBM 38, TOTAL and/or data standards used for banking applications a plus.

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We are seeking technical specialists with at least two years experience in the installation of word processing computers using integrated workstations. Working knowledge of WANG OIS or WANG VS is required, as well as hands on experience in the installation and upgrade of systems software.

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One World Trade Center, 78th floor
New York, N.Y. 10048

THE CHASE IS ON

PROGRAMMER

We are the Chicago office of an international Big 8 CPA firm with a large, multi-disciplinary consulting practice. Currently, we have an opening for a staff programmer, who will be responsible for the maintenance and tailoring of our proprietary forecasting and inventory control software. Primary duties will include correction of system errors, control of documentation and modifications due to particular client environment.

The ideal candidate will possess an undergraduate degree in engineering or technical degree with two or more years experience in an IBM System/34 or System/38 environment. Good machine operating, system utilities and RPG II programming skills are desired, with the ability to maintain COBOL programs and write IBM DOS JCL a plus.

Replies held in strict confidence: please include salary history.

Reply to CW-A3162
Computerworld
Box 880
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In just twelve years we've grown to sales of $20 million dollars and to the top 50 of 4,000 DP companies. Our continuing vigorous growth now opens the following opportunities in our Richmond office where you benefit from the in- depth experience, training, and variety so necessary for career satisfaction.

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Minimum three years on-line operations experience, knowledge of CICS, VTAM, TSO, ROSCOE, NCP, SNA, NVC, APL software applications, and good customer relation skills.

Computer Operators

Minimum two years experience on large-scale Amdahl/IBM mainframes. Experience with MVS, MVT, OS/JCL, JES desired. Shift work and some weekends required.

We offer competitive compensation and excellent company paid benefits. If you qualify, call or send your resume and salary history in the strictest confidence to:

Julie K. Dickinson
(No Agencies Please)

THE COMPUTER COMPANY

1905 Westmoreland Street, Richmond, Virginia 23230
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Data Processing

ROSS LABORATORIES is a division of Abbott Laboratories and the manufacturer of "Similac" infant formula. Ross is a multiplant manufacturer involved in high speed filling and packaging operations as well as large volume processing. We currently have the following positions available.

DATA ANALYST

The selected individual will assist the Data Administrator in the day-to-day functions necessary to maintain the availability, integrity and security of the division's data and data dictionary. Such functions include DBD and PSB maintenance; copy book maintenance; data base recovery; data base performance evaluations; data dictionary entry and any programming necessary to analyze or to expand the capabilities of the data base environment.

Qualified applicants must possess a Bachelors degree in Computer Science, Operations Research or Business Administration, and have 5 years COBOL/PL1 experience with 3 years assembler language. In addition, 2 years experience with data base and data base software required.

SYSTEMS ANALYST

We are seeking a Systems Analyst that will be responsible for development of informational systems to support the needs of Quality Assurance, Research and Development, and the Engineering functions of the Company. Also responsible for identifying user needs, systems design, program specifications, systems testing, documentation, implementation and maintenance. The Ross operating environment is a dual 370/138-4341, DOS/VS, DL/1, CICS, DMS.

Qualified candidates must have 3 years experience in PL/1 programming, 3 years systems analyses, one year CICS and one year VSAM/Data Base. A BS degree in Computer Science or related area is desired.

DATA CONTROL SUPERVISOR

The Data Control Supervisor is responsible for managing areas of responsibility in the distribution of computer generated data and data collection for Ross' public warehouses. Both exempt and non-exempt personnel will report to this position.

The qualified candidate will possess a BS degree in Computer Science or Business administration, and 1-3 years managerial background. Experience in systems analysis and computer programming also necessary to handle interfacing with systems and programming areas.

Ross offers an excellent compensation/benefits program. For confidential consideration, qualified applicants should forward resume to: **Paul Stewart**
Employment Manager

ROSS LABORATORIES
Division of Abbott Laboratories, USA
625 CLEVELAND AVENUE
COLUMBUS, OHIO 43216
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Bechtel

Systems Programmers

If you're looking for a professional challenge, no one can offer you more exciting opportunities than Bechtel, a world leader in the engineering and construction industry.

We have the following immediate openings:

VM systems programmer to install and maintain VM/SP on an IBM 3033 with MVS/SP and on multiple remote 43XX processors. We are presently planning an RSCS and VCNA Pass-Through network for Bechtel's world-wide operations. Requires knowledge of VM installation, tuning, and maintenance. MVS experience in a VM environment is a plus.

IMS systems programmer to install and maintain the following products: IMS/DB, DB/DC Data Dictionary, and the CICS-DL/I interface. A major database project is being developed at Bechtel, which will require experience in IMS/VS intervals, IMS performance analysis and tuning, backup and recovery, and database design.

VTAM systems programmer to convert a single domain ACF/VTAM Release 3 network to an MSNF environment, supporting multiple remote processors and 3705's. Also support TSO dial-up access using TCAM, NTO and the Yale Series/I ASCII CRT IUP. Participate in planning and implementation of an X25 interface to the Bechtel network. Requires experience in installing and maintaining ACF/VTAM and ACF/NCP in an MVS environment.

Systems programmer/analysts to provide software support for our UNIVAC 1100 series computers. Responsibilities include analysis of system and user problems plus support, testing and implementation of major system processors, such as SECURE, ASCII COBOL, MAPPER and ASCII FORTRAN. Requires extensive experience with UNIVAC 1100 Assembly Language, system processors and utility programs.

Bechtel offers competitive salaries and an excellent benefits package including a dental plan, medical and life insurance.

For consideration, send your resume to:

Pat Mabutas
Bechtel
Employment Dept. 46-3-82
P.O. Box 3965
San Francisco, CA 94119

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Our challenge has created your opportunity. Currently we are seeking top-notch computer specialists to meet our ever-increasing requirements for advanced technology within the following disciplines:

Compiler or Interpreter Design

– Develop, design, and implement compiler programs for real-time control systems. Familiarity with software development tools such as linkers, loaders, and text editors will be highly beneficial.

Data Base Management System Design

– Develop, design, and implement structures within data base management systems.

Performance Analysis

– Analyze and evaluate the performance of large, distributed real-time control systems through the utilization of simulation and analytic techniques. Will be responsible for guiding designers in tuning system definitions to improve throughput, response time, and resource allocation.

As a software engineering professional at Honeywell, you can take advantage of opportunities that will prove to diversify and broaden your technical expertise.

Top compensation and corporate benefits are a genuine reality at Honeywell. We conduct frequent surveys to ensure that the salaries of our top engineers remain in the upper percentile in all technical categories. As a result of our ongoing R&D efforts and continually expanding product lines, the potential for your professional growth is assured.

Put us to the test. If your credentials match our requirements, we want to arrange an interview. Call us COLLECT at (312) 870-5305.

If you are unable to telephone, send your resume for a confidential review to:

Bob Callahan
HONEYWELL
1500 W. Dundee Rd. Arlington Heights, IL 60004
Equal Opportunity Employer M/F

Honeywell

PROGRAMMER/ ANALYST

Cordero Mining Company, a subsidiary of Sun Oil Company, is seeking a Programmer/Analyst for a surface coal mine in Gillette, Wyoming. Responsibilities include maintaining current programs, implementing new systems and maintaining systems software for an on-site data general minicomputer.

Requirements include knowledge of COBOL, IBM/OS/JCL and structure techniques.

We offer an excellent salary, benefits and relocation package. If interested, send resume including salary history to: **The Employee Relations Department, CORDERO MINING COMPANY, P.O. Box 1449, Gillette, Wyoming 82716. Or, call 307-682-8005.** We are An Equal Opportunity Employer, M/F.

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Systems Programmers and Software Engineers are needed for: Architectural Specifications, Virtual Memory Management, Process Structuring, Indexed File Systems, User and Operator Interfaces. Products currently in development include integrated office systems that combine word processing and interactive data processing and a complete, highly visible spooling system. Intelligent clustered device support and advanced job stream control systems are being planned.

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Systems Software Engineers are needed for the development of integrated business graphics packages allowing added user flexibility for creating documents that include text, images, plots and equations, flow charting and scientific and chemical equation support.

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You'll find Wang offers the best benefits program in the industry including profit sharing, stock plans, company paid dental, medical and life insurance, tuition reimbursement and our pacesetting child day care program.

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Sperry Univac is currently seeking Systems Analysts and Programmers to join its team of professionals servicing the Southern Baltimore, MD, Washington, DC, Harrisburg, PA, Philadelphia, PA, Northern NJ and Connecticut areas. Successful candidates should possess at least 1 of the following skills:

- 1100 series implementation experience
- 1100 Exec internals
- 1100 DMS design
- System 80, series 90, OS3 internals
- 1100 systems design, pre-sales capability

If you have 2 or more years of experience in any of these areas, we can offer you a challenging career opportunity with professional growth. If interested, please call or send resume in confidence to: **Dennis S. Barnabei, (215) 293-0300, Sperry Univac, 480 Swedesford Road, Wayne, PA 19087.** An Equal Opportunity Employer M/F.

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REQUIREMENTS: At least eight years of progressively responsible experience in data processing program direction and a bachelors degree in business administration or related field.

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SYSTEMS PROGRAMMER

Florida

A. Duda & Sons Inc., a leading agribusiness headquartered in suburban Orlando, needs a Systems Programmer on its corporate EDP staff. Duda has a strong data processing organization that utilizes an IBM 3031 with OS MVS-JES2. We operate on a data base concept with on-line telecommunications capabilities.

The person selected will work on new systems development, enhancement of existing software and troubleshooting supervisory programs. Requires BS or MS in Computer Science or equivalent experience, coupled with superior abstract reasoning and analytical skills. Experience in systems programming is desirable but not mandatory.

This position offers the opportunity for extended professional development plus an above average compensation package. To inquire in confidence call Joe Casey, weekdays, at (305) 327-1030 or send your resume including present salary to:

DUDA

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Intel's success has been the result of dedicated, self-motivated people working together. As an integral part of our team, you will support the development efforts on our superior computer systems. Bring your expertise to a company that's famous for turning imaginative ideas into reality. Choose from any of the following areas, where opportunities exist in all levels of Systems Programming.

IBM 3033

Be a part of a central group responsible for supporting international computing while building an on-line CICS network IBM environment with 600 terminals. We need a variety of skilled individuals ranging from 2 years' experience to senior level professionals. This installation consists of an MVS/SE2 on a 12 mByte 3033. A partial list of software includes CICS/VS, ACF/VTAM, ACF/NCP, NCCF, NPDA, OMEGAMON, TSO JES2.

DEC-10

We are seeking a Senior-level DEC professional to provide technical support on a TOPS-10 monitor running on DEC-10 SMP systems. This large network spans three sites and there will be a very large processor of the CRAY-1 Class in the future. An intermediate level opening is also available. This position requires two-four years' directly related experience.

HP 3000

A key player is needed to set up a central environment for the remote control of at least 7 complete systems for the end of 1982 which will support a newly distributed manufacturing system utilizing the HP 3000 computers. Specific expertise on the MPE operating system, COBOL/3000, SPL/3000 and the IMAGE/3000 required. This position requires two years' minimum experience doing HP support, experience with data communications is desirable.

Sr. Scientific Programmer

This person will provide technical and programming support to DEC users and programmers. Requires three-five years' experience in using and supporting time-shared scientific data processing applications. Extensive DEC-10 experience required along with familiarity with some numerical analysis, linear algebra and probability concepts.

We offer an exceptional compensation/benefits package which includes a stock purchase plan and an 8-week sabbatical leave program. Please send your letter/resume to **Intel Employment Department, MS 4-211, 2625 Walsh Avenue, Santa Clara, CA 95051.** We are an equal opportunity employer m/f/h.

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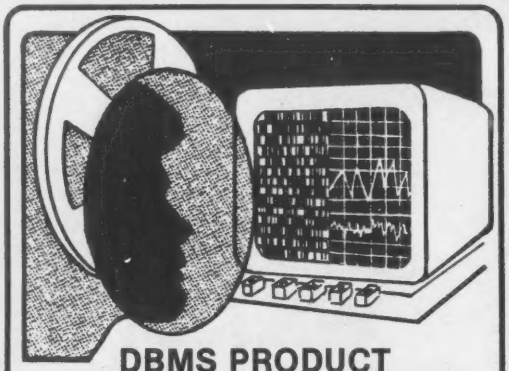

DBMS PRODUCT DEVELOPMENT & SUPPORT

APPLIED DATA RESEARCH, the world's oldest and largest independent systems software products company, has positions available for DP professionals in state-of-the-art product development and support at our Dallas based **DATACOM DB/DC** product group.

Applicants must be skilled in IBM Assembly language and have a minimum of 3 years programming experience. Some data base, data communications and/or systems programming experience very desirable.

APPLIED DATA RESEARCH offers a very competitive salary commensurate with your background and potential and a comprehensive benefits package which includes semi-annual bonuses and dental, prescription drug and tuition assistance plans. For more information please forward your resume including salary history, in strict confidence to: Personnel Director.

APPLIED DATA RESEARCH, INC.
8515 Greenville Avenue
Dallas, Texas 75243

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ADR

Career Opportunities

WALT DISNEY WORLD CO. has immediate career opportunities for computer science professionals interested in working in an advanced communications network including; point of sale, hotel systems and on-line accounting systems along with many others which currently support the Magic Kingdom—and in October 1982 our most ambitious project, EPCOT Center.

Qualified candidates for the following positions should send a resume with salary history, in confidence, to the address listed below.

PROGRAMMER ANALYST

Innovative Programmer Analyst with 2-5 years recent systems development experience on large scale business computers are needed to take an active role in the design of batch and on-line business systems using COBOL as primary language.

SENIOR SYSTEM PROGRAMMER

Individuals should possess 5-8 years system programming and mini computer experience along with the ability to provide operating system, data base and communication network support in a SPERRY UNIVAC 1100 or V77 environment.

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SYSTEMS PROGRAMMER

TOSCO CORPORATION is the nation's second largest independent refiner of petroleum and a leader in the development of alternate forms of energy.

We are currently interviewing for a SYSTEMS PROGRAMMER in Bakersfield, California, our Corporate Data Processing headquarters.

This position requires experience in:

- **SMP**
- **Generation and maintenance of Operating System MVS**
- **Installation and maintenance of Program Products such as COBOL, FORTRAN, etc.**
- **Strong BAL experience**

Any experience in VM/CMS, VTAM/NCP, VSAM, or BTAM would be a plus, but is not necessary.

We are a rapidly expanding facility with an internal-promotion-oriented policy.

TOSCO offers an outstanding starting salary, competitive benefits plan, complete relocation package, atypically low cost-of-living community and a relocation bonus of one month's salary.

If you feel that your abilities meet our needs, please contact us by either sending your resume to the address below, or call collect to Jan Leavitt:

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P.O. Box 2860
Bakersfield, CA 93303
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If you have a minimum of three years programming or computer maintenance experience, we would like to talk to you about teaching opportunities at TSTI-Harlingen. If you would like to find out about our job opportunities, our school, the Valley's sub-tropical climate, a great beach, and more, write or call.

PERSONNEL DIRECTOR

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Florida State University

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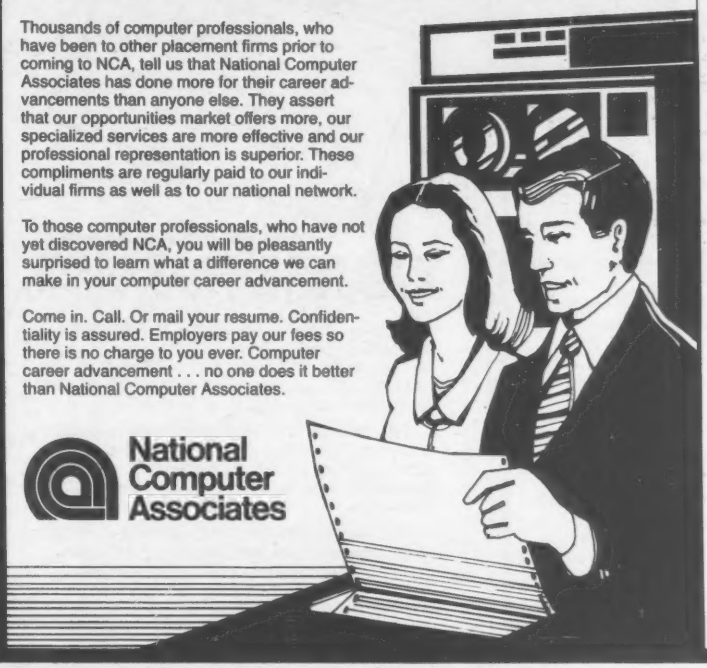

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The successful candidate will have a minimum of two years systems programming experience, including DOS or OS installation. Experience with CICS, DL-1, COBOL or PL/1, and ASSEMBLER is also required. DOW VSI installation experience is desirable.

PROGRAMMER ANALYST

Successful candidate for this entry level position will have appropriate degree as well as experience in programming and potential for DP management. Will be involved in design and implementation of systems and programs, plus maintenance of company-wide computer network.

Our location is in an outstanding recreational area in Western Michigan. Both positions offer excellent salary and benefits packages. Send resume and salary requirements to:

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117 WATER STREET
ALLEGAN, MI 49010 (616) 673-8451

SAUDI ARABIA

SYSOREX INTERNATIONAL, INC., a rapidly growing Systems Management Company, now developing innovative multi-technology systems in Saudi Arabia seeks

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Manage EDP instructors for Saudi Arabian users. Responsible for management of trainers, involved in instruction of computerized information systems. Based in SAUDI ARABIA. Arabic fluency not required. Degree necessary.

Software Programmers

Positions involve developing and maintaining innovative large-scale IBM TP systems in a distributed EDP environment. Min. 3 yrs. experience with OS/VSI, VM, MVS, CICS, DBMS, TP (RJE and Interactive). Degree required.

We have requirements for Systems Programmers in Cupertino, CA involving travel to Saudi Arabia on a regular basis as well as positions based in Riyadh, Saudia Arabia.

Field Service CPUs

You will be responsible for helping to maintain our Magnuson M80/43 and peripherals. You must have large scale digital computers CPU maintenance experience. Positions in RIYADH, SAUDI ARABIA.

Programmer Analysts

Positions involve developing and maintaining innovative large-scale IBM TP systems in a distributed EDP environment. Experience with COBOL, general business, applications, OS/VSI, MVS, CICS, DBMS, TP.

Programmer Analysts positions in both Cupertino, CA with regular travel to Saudi Arabia and in Riyadh, Saudia Arabia. Requires degree and min. 5 yrs. experience.

We offer such benefits as medical, life, ADD, disability, profit sharing, 5 day work week, overseas premium. While based in Saudi Arabia, you will additionally receive 30 working days vacation, 15 holidays, free furnished family housing, free children's education, annual return home travel, paid relocation expenses plus eligibility for new liberal tax exclusions just recently passed.

Please send resume, including salary history, to Personnel Department, SYSOREX INTERNATIONAL INC., 10590 N. Tantau Ave., Cupertino, CA 95014. (408) 996-3380.

SYSOREX

Sysorex International Inc.

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So we are looking for the kind of outstanding individuals who can keep us ahead. People who understand what it takes to run, as well as build, a network. Who are talented in operating systems like UNIX, and network architecture like SNA. And who have the special knowledge required to apply state-of-the-art software tools—like data base—to today's network management problems. People ready to make a big impact on a medium-sized development organization with a record of solid accomplishment.

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The substantial growth we experienced in 1981 is continuing in 1982. This consistent expansion has created a cross-section of software openings—from **individual contributor** to **manager** level. Come grow with us in an environment of promise for the future.

Codex offers competitive salaries and a comprehensive benefits package including dental insurance and profit sharing.

Interested candidates should please forward a resume, in confidence, to Jerry Dombrowski, CODEX CORPORATION, 20 Cabot Boulevard, Mansfield, MA 02048.

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Security Pacific Bank, Southern California's largest financial institution has immediate openings in its Data Processing Planning Department for Capacity Management Specialists.

We are interested in you if you have experience in one or more of the following:

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- **EQUIPMENT EVALUATION**

These challenging and exciting positions offer a wide spectrum of responsibilities, as well as a high degree of visibility throughout our Automated Data Processing Group. A knowledge of simulation, modeling and performance tools is desirable. The successful candidates will have the opportunity to work in a state-of-the-art environment which has become a model for the industry. We have the latest hardware and software including 3033's, 3081's, MVS/SP, IMS and TSO.

In addition to highly competitive salaries, we offer outstanding benefits including educational assistance and up to four weeks vacation the first year. For immediate consideration, please call **Keith Shultz** at **(213) 507-2197,** or send your resume with current salary to:

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Ross Laboratories is searching for qualified individual to assist in the design and implementation of the division networking strategy. Strategy will center around IBM's NCP and SNA technologies.

Successful candidate will possess a Degree in Computer Science, Math or Business Administration. We require 2 years experience with IBM's SNA and NCP software, and 4 years experience in ASSEMBLER language with 4 years experience in networking. Operating environment is a Dual 370/138-4341, DOS/VS, DL/1, CICS, and DMS. This is a high-growth information network environment.

ROSS offers an excellent salary and a full benefits package that include profit sharing and comprehensive insurance. For confidential consideration, submit resume in confidence to:

Paul Stewart,
Employment Manager

ROSS LABORATORIES
Division of Abbott Laboratories, USA
625 CLEVELAND AVENUE
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Now is the time to discover the special benefits of a career with us. We're Arizona Public Service Company, headquartered in Phoenix, Arizona.

We are currently involved in the construction and staffing of the 3 unit Palo Verde Nuclear Generating Station, located 50 miles west of Phoenix. We have immediate openings for Computer Engineers.

Successful candidates must have DEC/RSX 11, HW/MOD 400, SEL/RTM and/or MODCOMP/MAX 4 software experience.

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Steve Harnden
ARIZONA PUBLIC SERVICE COMPANY
P.O. Box 21666, Station 8000
Dept. CW 1228
Phoenix, Arizona 85036

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APS.
Arizona Public Service Company

Analysts

Billion dollar electric utility holding company with a large scale centralized data center has openings for Senior Programmer/Analysts and Programmer/Analysts.

We are seeking persons who have been involved with design, development, implementation, and installation of material management or financial application systems in a structured environment. Development emphasis will be for Construction Project Management, Financial Information, or Employee Information Systems with heavy user involvement.

Positions require minimum experience of 5 years for the Senior Programmer/Analysts and 3 years for the Programmer/Analysts. CICS and COBOL a must. Data Base and V-SAM helpful.

Mail resume and salary history to Employee Relations Division. Principals only, please.

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Headquarters Positions Sales Planning Specialist

Responsible for developing product sales plans and managing implementation. Minimum 3 years experience with printer manufacturer in headquarters sales and/or marketing.

Submit resumes to
M.G. Grimes, Manager Employee Relations
General Electric Company
Data Communication Products Department
Waynesboro, VA 22980
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DIRECTOR TECHNOLOGY ASSESSMENT

The selected candidate will perform state-of-the-art technology planning and evaluation, comparative, competitive and financial analyses, needs/problem identification, solution plan development, installation planning and coordination.

Candidates must be knowledgable in the latest advances in information processing technology with skills in:

- Equipment Evaluation (CPU's thru WP)
- Communications technologies, architecture and protocols
- Software Evaluation (System Control, System Support, Telecommunications)
- Data Base Management
- Lease/Purchase Analysis
- Capacity Planning, Configuration Management
- Installation Planning
- All of the above in a distributed environment including large and small systems

Excellent verbal and written skills required. Forward resume, including salary requirements to **Alan Holz, 332 Minnesota Street, St. Paul, MN 55101.**

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First Computer Corporation
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Our $710 million bank is looking for an individual to play a key role in our Technical Support Services Department. This position will provide guidance and technical advice to our software programmers and function in a liaison capacity between data processing and the systems & programming staff. With a minimum of 5 years of solid experience in an IBM environment, you will be responsible as a project leader to develop on-line applications on our IBM 3033 MVS/SP while helping to chart the direction of our telecommunications future. To approach this position. The candidate will have solid experience in CICS/VS, VSAM, COBOL, OS/VS, JCL, TSO, and a sound applications programming history. We offer a competitive starting salary, excellent benefits and a realistic relocation package. For confidentical consideration please forward your resume with salary requirements to Scott C. Stevens.

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Programmer Analyst
Systems Programmer

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These positions involve development of on-line applications using IBM 4331 with DOS/VSE, DL-1, CICS/VSE. Applications include all areas of student information, program management, financial management, supplies and physical plant management. You'll enjoy direct contact with end user.

The San Bernardino area is close to mountain and desert resorts, beaches and the unique city life of Los Angeles.

Fully-paid medical/dental/life insurance for you and your dependents, regular salary advancement and immediate entry into the Public Employees Retirement System are a few of the rewards you'll receive. Please send resumes to: **Larry Glick, San Bernardino City Schools, 777 North "F" Street, San Bernardino, CA 92410.**

san bernardino city schools
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Individual will maintain our present accounting system while integrating new software packages. You will also train personnel and assist with new system documentation. BS in Computer Science (or equivalent), plus three years experience programming in RPG II and COBOL, designing business systems and working with IBM DOS/VS or VSE systems are required. In addition, one must have ability to communicate with Data Processing Personnel, Users and Management.

If you are an independent minded pathfinder with a solid background in Data Processing, we want to tell you more about our unique workstyle and career package. Learn the details about our fine salaries and benefits program to include a handsome relocation allowance. Call us collect or forward a resume, along with salary requirements, to our Employee Relations Department. Perry Gas is an equal opportunity employer.

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PERRY GAS

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NAS has the largest installed base and the broadest product line in the business. Our systems have unsurpassed reliability records. And our field service team ranks consistently among the top three in the country.

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In a year projected to be even more competitive than the last, NAS continues to offer talented professionals truly exceptional career opportunities. We didn't change our tune. But that's a very good reason for you to change yours.

Explore these opportunities to join the complete computer company today:

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Nationwide opportunities require experience on IBM CPUs or other large mainframes and associated peripherals.

Systems Support Representatives

Nationwide opportunities require MVS, VS1, VM or DOS/VS experience to provide technical and software support to our CPU customers.

Field Support Representatives

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Opportunities in several geographical locations for professionals with experience selling large mainframes and peripherals in the IBM plug-compatible industry.

Systems Engineers

San Francisco Peninsula opportunities for DOS/VSE and MVS Systems Programmers for our Software & Benchmark Development group and Large Systems Architecture and Planning.

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East and West Coast opportunities for professionals with relevant experience.

Please send your resume in confidence to Rosette Wuthrich, National Advanced Systems, 800 East Middlefield Road, Mountain View, CA 94043; (415) 962-6054. We are an equal opportunity affirmative action employer.

The Complete Computer Company

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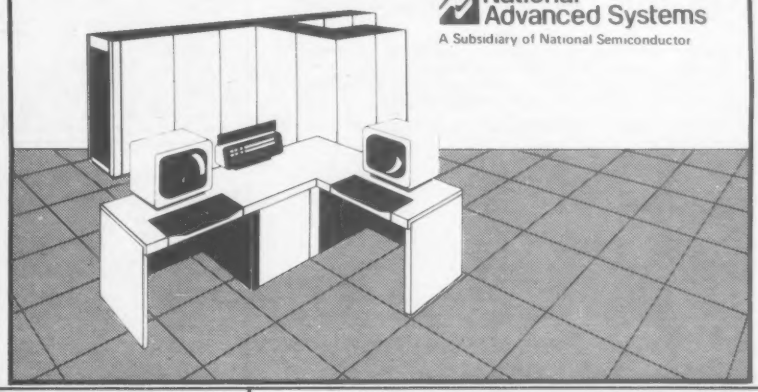

Management

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Do you have the desire to be associated with a young, dynamic, growth oriented company? We are a leader in the microcomputer field, recognized both on the domestic and international market. Our sales growth has been nearly 300% annually during the past 2 years with revenues expected to reach $50 million this year. Due to new and unique marketing programs and a scheduled product line unsurpassed in the industry, sales will continue to skyrocket.

In order to accomplish this, we need a seasoned sales manager with either national sales management experience or a heavy regional sales background. Past experience must be in the microcomputer field dealing with dealers on the OEM market. Applicant must successfully demonstrate the ability to hire and direct our entire national sales staff.

We offer an attractive base salary with a commission contract which permits unlimited earnings. If you have the drive and organizational ability to direct this fast-paced sales effort, please send resume and salary history to:

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Director of Marketing
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Qualified candidates will have 2+ years of experience as an EDP auditor preparing audit program reports and reviewing new data processing systems. Good oral and written communication skills essential. A BS degree required with exposure to COBOL preferred.

Our benefits are complete, our salaries extremely attractive. For immediate consideration call (213) 742-6411 or submit your resume to PACIFIC HEALTH RESOURCES, 1423 So. Grand Avenue, Los Angeles, CA 90015. An equal opportunity employer.

Pacific Health Resources
Management Resources for the Health Care Industry

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To investigate these challenging opportunities, send resume and salary history to C. Dowell, Dept. 1651.

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We are looking for the unusual, detail-oriented individual who will also see the full scope of the business situation creating the need for information. This person must have superior interpersonal skills to effectively interact with people from many departments. The successful candidate for this position will have a Bachelor's degree in computer science, mathematics, or perhaps in business with a concentration of numerical course work. A minimum of three years experience in programming and system design, preferably in pharmaceutical marketing applications are required. If you have these qualifications, and a strong desire to work in a marketing environment, we'd like to show you why this is an exceptional opportunity.

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For prompt consideration send resume in confidence to: Steve Sons, Manager, Executive Search & Placement, Dept. #82, Evansville, IN 47721.

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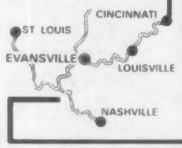

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Research Programmer/Analyst

Need experienced Programmer/Analyst to staff internal consulting position in a petroleum R & D Institute. Should have a minimum 5-10 years experience in computing support in an R & D environment, B.S. degree - M.S. preferred in a technical discipline. Duties will include computing support of researchers in areas of simulation, modeling, finite element analysis, graphics and etc. Should have background in IBM VM/CMS, S2000, Mark IV, APL, PL/1, FORTRAN, DISSPLA, Tellagraf, etc. Knowledge of Spanish desirable. Please rush resume with salary history to client's consultants (no agencies please).

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SYSTEMS ANALYST
COMPUTER PROGRAMMER

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Existing computer enviroment consists of Data General host computer and Calcomp graphic terminal, plotter and digitizer. Successful applicants are expected to work in conjuction with architects and urban planners in order to develop new graphic softwares as inter-disciplinary team. Experience in computer graphics is therefore essential, and previous experience in programming for building design and/or urban planning, mapping would be advantageous.

Salary would be commensurate with academic degrees and professional experience. Benefits will include furnished free housing, professional and transportation allowances, two-months annual paid holidays with air fares up to four family members.

Applications with detailed curriculum vitae should be sent to **Dr. Ahmed Farid Moustapha, Dean, College of Architecture and Planning, King Faisal University, 2425 West Loop South, Suite 540, Houston, Texas 77027.**

Computer Science, Associate or Assistant Professor. Three positions; One position is full-time Computer Science and two are at least 50 percent Computer Science with rest of load in Mathematics. Involvement in undergraduate instruction and curriculum development. Ph.D. in Computer Science is preferred; Ph.D. in Mathematics is required. Positions available September 1, 1982. Salary dependent on qualifications. Department has 256 Computer Science majors. Available facilities include two PDP 11/70's, several micros, as well as remote entry to two IBM 3031's. The Computer Center has 24 terminals. Send resume, transcripts, and three letters of reference by March 1, 1982, to **Dr. Sue Boren, Department of Mathematics and Computer Science, The University of Tennessee at Martin, Martin, Tn. 38238-5049. Phone: 901-587-7355.** UTM IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

PROGRAMMER ANALYST

Federal Mogul Corp. at Malden, MO has an immediate opening for a Programmer Analyst. The successful applicant will be responsible for designing, programming and implementing manufacturing systems applications. We require a B.S. in Computer Science with at least 2 years experience together with ANS COBOL proficiency. Knowledge of JCL is desirable. We offer a good benefit package, a competitive salary and a potential for professional development within the corporation. Send resume along with salary history and requirements in confidence to

Federal Mogul Corp.
Attn: Personnel
Malden Industrial Park
Malden, MO 63863

An Equal Opportunity Employer.

PROGRAMMER/ANALYST
OS/CICS/COBOL
IBM - 3033
REALTIME SYSTEMS

Major company in music and home entertainment field seeks a senior staff member to support its national on-line Information System.

Candidate must have a minimum experience of three years as a programmer/analyst with a comprehensive knowledge of ANSI COBOL, CICS, and ROSCOE under IBM 360-65 or above running under OS. Assembler is a plus.

*Position offers excellent growth potential
*Central mid-town Manhattan location
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*Challenging responsibilities
*Excellent Salary and benefits

Send resume in confidence to:

Reply to CW-A3164
Computerworld
Box 880
Framingham, MA 01701

An Equal Opportunity Employer

PROGRAMMER

Beautiful city on the Gulf of Mexico, sugar white sand beaches and home of Pen Air Federal Credit Union.

Pen Air Federal C.U. is a progressive financial institution expanding D.P. Department to meet the challenges of increasing service requirements. Ideal candidate will possess five years programming experience and two years on IBM SYSTEM/3 15D, RPG II, with Communication Control Program and remote terminals. Prefer candidate with proven track record from the financial services industry. In addition to competitive starting salary, we offer an excellent benefit package including dental insurance.

Please forward resume with salary history and requirements to:

Carolyn Koon
Personnel Director
Pen Air Federal Credit Union
Bldg. 3464, NAS
Pensacola, Florida 32508

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SYSTEMS PROGRAMMERS, large IBM	$23-40K
DATA BASE SPECIALIST	$28-35K
PROJECT LEADER, Mfg. 4300	$30-37K
MGR. SYSTEMS & PROG., 4300	$40-45K

Please include geographic preference & salary requirements with resume.

Mail to **Carol Stuart, D.P. Division, ETHAN ALLEN Personnel Agency, 30 West State Street, Binghamton, New York 13901**

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One or more Tenure-Track Positions in Computer Science. Salary and rank dependent on qualifications, Fall, 1982. Applications due March 1, 1982. Ph.D. in computer science or closely related discipline preferred with emphasis in programming languages, systems programming, operating systems, microcomputing systems, and programming methodology. Teaching load 12 hours. **Contact Dr. R.H. Cranford (214) 566-1471.** AA/EOE.

DIRECTOR MANAGEMENT INFORMATION

The challenge is to develop a strategic approach to management information services. The need is immediate. The opportunities are unlimited. The selected candidate will have distinguished themselves as a professional, having developed strategic objectives. Implemented action plan, and achieve the results in a retail environment. Our future needs are quickly outgrowing our current capabilities.

As a leading retailer in the south-east, our business centers around inventory control, customer service and multi-unit operations. Our current IBM hardware is functional, our immediate future is state-of-the-art. The hardware you have used is not nearly as important as your demonstrated ability to devise and implement a comprehensive information management plan. If you are seeking challenge and opportunity and your background and experience matches our needs, we would like to tell you more about us. For consideration send your resume, including salary history to:

Director of Personnel
Ellman's Inc.
2740 Cobb Parkway
Smyrna, GA 30080.

Director of Computer Services

Grinnell College is a selective, 4-year, private liberal arts college of 1,230 students and 115 faculty members. Computing operations are based in two DEC PDP 11/70 central processing units. Interacting terminals: 60 for academic computing (750 student accounts) and 25 for ADP. The college is committed to the principle of stressing general education in computing. Staff of 12 plus Director and including experienced Associate Director of Academic Computing. All units of administration involved in use of computer. College is very interested in substantial further development of both academic and administrative use.
We are seeking person with: (1) advanced academic credentials; (2) knowledge of technical aspects of computing, preferably with experience in RSTS environment; (3) significant experience in administrative data processing in an academic setting and ability in administrative management; (4) knowledge of and experience with programming languages such as BASIC and FORTRAN, (5) experience with Data Management Systems.
This is a full time, 12 month position available immediately. Salary highly competitive. Application deadline Feb. 12, 1982. Send resume and 3 letters of recommendation to Waldo S. Walker, Executive Vice President, Grinnell, College, Grinnell, Iowa, 50112.

Equal Opportunity, Affirmative Action Employer.

PROGRAMMER II

2 - 4 years solid COBOL experience in business application solid accounting background and excellent communications skills required. Hewlett Packard experience required. Competitive salary and excellent fringe benefit package.

Send resume with salary history to:

Alice Kellar
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E. 502 Boone Avenue
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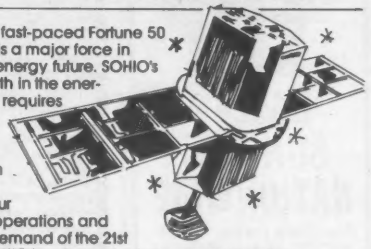

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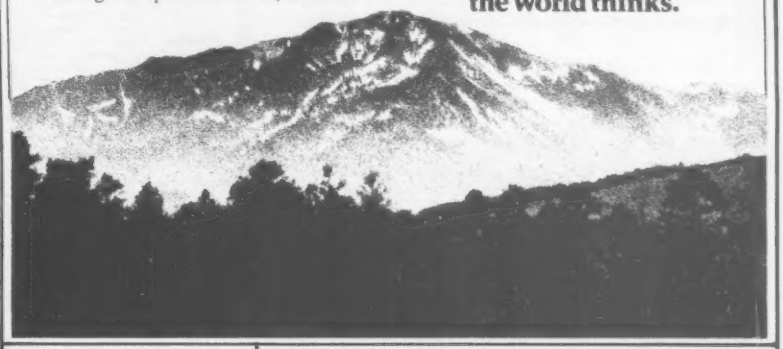

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Candidates should possess a Masters Degree but a Doctorate is desired. An applicant with a Bachelors Degree and extensive administrative experience would receive serious consideration. Demonstrated management experience and interpersonnel skills are required. Salary is negotiatable. Appointment to begin April 1, 1982 or as soon as possible thereafter. Resume and 3 letters of reference should be submitted by March 1, 1982 to:

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Selected individual will provide management direction and technical guidance in the planning, development, and maintenance of the City's data processing, office automation and telecommunications areas. Responsibilities will include development of long-range plans for improving organizational systems, evaluation and recommendation of both hardware and software, supervision and training of employees in the Information Systems Division, and coordination with service users, private firms and other governmental agencies who interface with City information system services.

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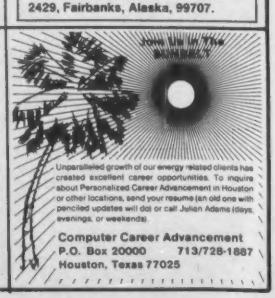

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A degree is preferred with a minimum of 2 years experience in any of the following areas:

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- Position requires a Bachelors Degree in Math, Computer Science or related field and at least 3-5 years in data processing. Knowledge of COBOL, FORTRAN, MARK IV, OS JCL, SAS, VSAM, ROSCOE and experience in instruction are desirable. Should be interested in problem-solving and research.

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- Position requires a B.S. in Computer Science, Engineering, Applied Math, Science or equivalent. Must have 3 years minimum experience in computer applications, preferably in several different areas. Requires experience on an IBM OS/VS system and on at least one time-sharing system. Experience on VSPC, ROSCOE, TSO desirable.

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SYSTEMS PROGRAMMER ANALYST/PROGRAMMERS

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ANALYST/PROGRAMMERS

Responsible for design and development of new applications and future enhancement of applications. Requires a minimum of 5 years combined systems analysis and programming experience. Experience should include requirements analysis and procedure development of on line systems using DBMS tools. Experience with business applications and minicomputers is highly desirable.

Please submit resume and salary history:

Director of Information Services
State Gaming Control Board
4220 South Maryland Pkwy, Bldg D.
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TENURE-TRACK POSITIONS IN COMPUTER SCIENCE.

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Resumes with letter of application must be received and/or postmarked by March 30, 1982, & forwarded to Ms. Elisabeth Palmer, Campus Personnel Services

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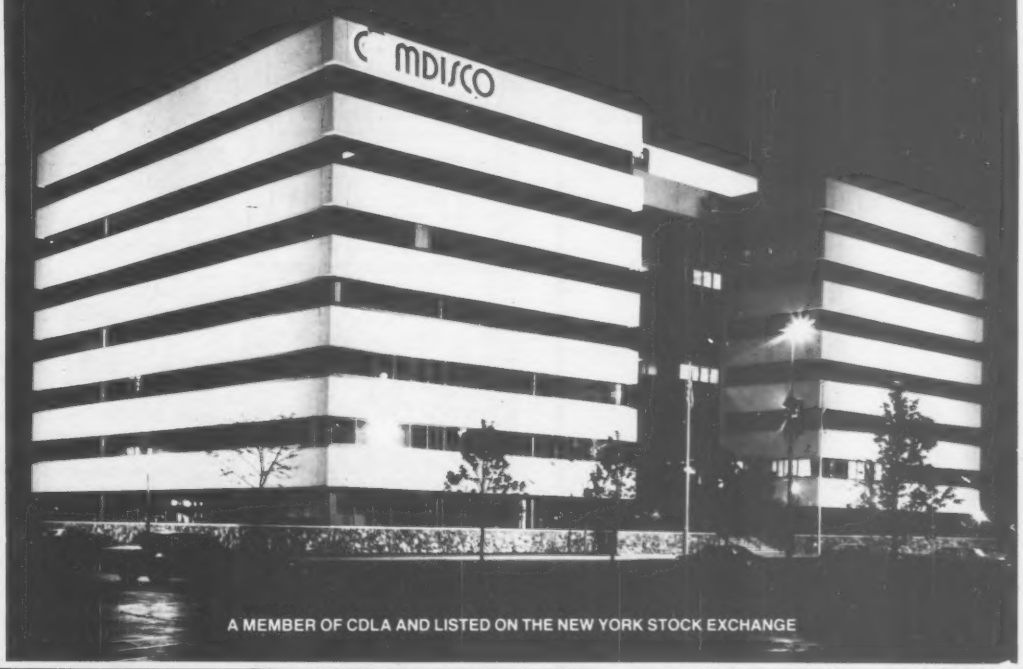

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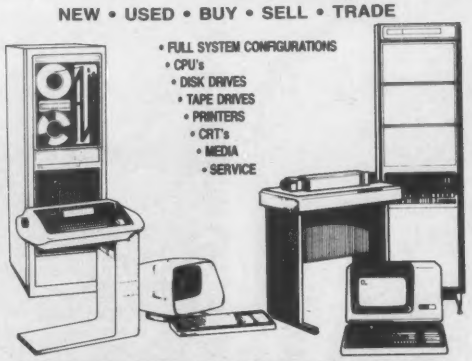

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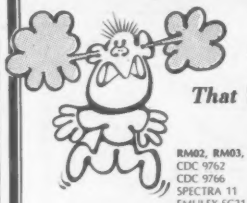

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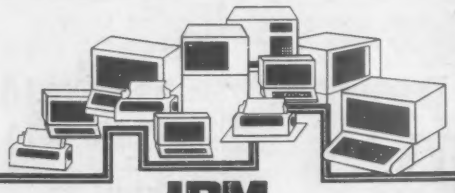

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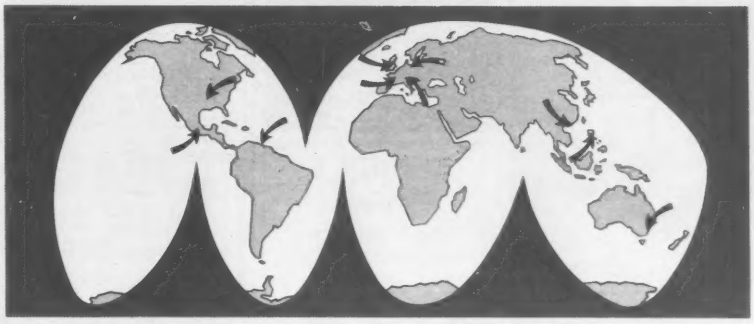

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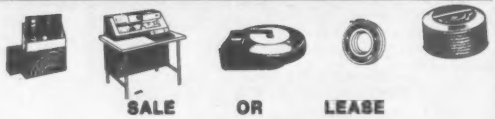

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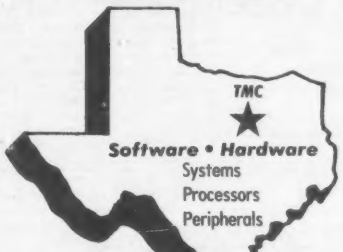

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Only bids received prior to the aforementioned time and contained in a sealed envelope marked with the Bid No. SP9-81, will be considered.
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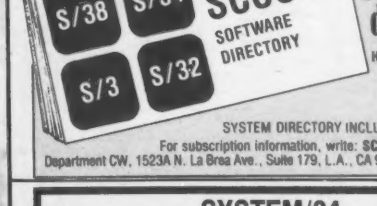

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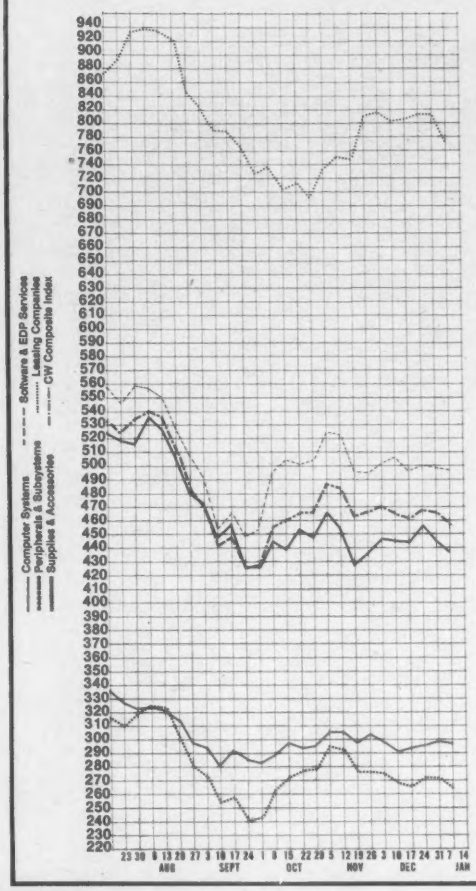

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CLOSING PRICES WEDNESDAY, JANUARY 6, 1982

All statistics compiled, computed and formatted by TRADE QUOTES, INC. Cambridge, Mass. 02139

EXCH		1981-82 RANGE (1)	CLOSE JAN 6 1982	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
A	AMDAHL CORP	23- 48	28	- 5/8	-2.1
N	BURROUGHS CORP	28- 72	32 3/4	-1 5/8	-4.7
O	COMPUTER AUTOMATION	8- 28	8 3/4	- 1/4	-2.5
N	CONTROL DATA CORP	18- 42	34 1/2	- 3/8	-1.0
N	CRAY RESEARCH INC	28- 49	33 3/8	-1 1/4	-3.4
N	DATA GENERAL CORP	42- 87	52 1/4	-1 5/8	-3.0
N	DATAPOINT CORP	40- 68	49 5/8	-1	-1.9
N	DIGITAL EQUIPMENT	80-113	84 1/2	-1 5/8	-1.8
A	EECO INC	7- 18	7 3/4	+ 1/4	+3.3
N	ELECTRONIC ASSOC.	5- 13	8 3/8	- 3/8	-5.5
N	FOUR-PHASE SYSTEMS	18- 48	38 3/8	-1 1/8	-2.8
N	FOXBORO	42- 62	52 3/4	+ 1/2	+0.8
O	FULCRUM COMP GRP	1- 3	3/8	0	0.0
O	GENERAL AUTOMATION	8- 18	8	- 1/8	-2.0
N	HARRIS CORP	38- 60	38 1/2	-1 3/8	-3.4
N	HEWLETT-PACKARD CO	33- 54	38 1/4	-1 1/8	-2.8
N	HONEYWELL INC	68-115	89 1/8	-1 3/8	-1.5
N	IBM	48- 73	58 3/4	- 1/2	-0.8
O	MAGNUSON COMP SYSTS	10- 32	10 3/4	- 3/8	-3.3
N	MANAGEMENT ASSIST	11- 28	10 5/8	- 3/8	-3.4
O	MINI-COMPUTER SYST	1- 4	5/8	+ 1/8	+25.0
N	MODULAR COMPUTER SYS	7- 32	8 5/8	- 5/8	-6.7
N	MOHAWK DATA SCI	11- 32	14	- 1/2	-3.4
N	NCR	39- 76	42 1/4	-1 1/2	-3.4
N	PRIME COMPUTER INC	18- 48	22	-2	-8.3
N	PERKIN-ELMER	21- 36	26 1/8	+ 1/4	+0.8
N	SPERRY CORP	30- 65	34	-1	-2.8
O	TANDEM COMPUTERS INC	13- 35	27	- 3/4	-2.7
N	TEXAS INSTRUMENTS	75-151	78 1/4	-5 1/8	-6.2
A	WANG LABS.	23- 48	28 3/8	- 1/4	-0.8
	LEASING COMPANIES				
O	BOOTHE FINANCIAL CP	18- 28	22	-1	-4.3
N	COMDISCO INC	18- 27	25	- 1/2	-1.9
B	COMMERCE GROUP CORP	1- 2	3/4	- 3/8	-33.3
O	COMPUTER INVSTRS GRP	1- 4	1/4	0	0.0
O	CONTINENTAL INFO SYS	4- 9	5 1/2	+ 1/4	+4.7
A	DCL INC	3- 4	3 3/4	0	0.0
N	DPF INC	5- 13	10 1/2	0	0.0
O	ITEL	1- 15	5/8	- 1/8	-16.6
O	LEASPAC CORP	1- 2	1/8	0	0.0
N	RELIANCE GROUP INC	85-100	88	+3	+3.1
N	U.S. LEASING	18- 30	24 3/4	-1	-3.8
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	2- 6	2 1/2	0	0.0
O	ADVANCED SYSTEMS INC	10- 15	13	- 1/4	-1.6
O	ANACOMP INC	11- 19	11 7/8	- 1/4	-2.0
O	ANALYSTS INTL CORP	3- 14	8 1/2	- 1/2	-7.1
A	APPLIED DATA RES.	13- 25	20 5/8	- 5/8	-2.9
B	ASTRADYNE COMP IND	4- 5	4 3/8	- 1/2	-10.2
N	AUTOMATIC DATA PROC	22- 32	25 1/2	+ 1/4	+0.9
O	CGA COMPUTER ASSOC	4- 25	8 1/4	+1	+19.0
O	COMPUTER HORIZONS	1- 5	3 1/8	+ 1/8	+4.1
O	COMPUTER NETWORK	6- 8	6	- 1/4	-5.8
N	COMPUTER SCIENCES	12- 30	13 1/8	+ 1/8	+0.9
O	COMPUTER TASK GROUP	10- 23	10 1/4	-1 1/2	-12.7
O	COMPUTER USAGE	2- 10	3	- 3/8	-11.1
O	CONSERV CORP	9- 18	14 1/2	- 1/2	-3.3
O	COMSHARE	7- 21	8 1/2	- 5/8	-8.7
O	CULLINANE DATABASE	15- 37	36 1/2	-3 3/4	-10.9
O	DATA DIMENSIONS INC	0- 4	3/8	+ 1/8	+75.1
O	DATATAB	1- 4	1 5/8	- 1/8	-7.1
O	DSI CORP	4- 9	5 1/8	- 1/4	-4.6
O	DYATRON CORP	3- 11	3 5/8	0	0.0
N	ELECTRONIC DATA SYST	15- 30	23 5/8	- 3/8	-1.5
O	INFORMATICS INC	17- 34	25	-1	-3.8
O	INSYTE CORP	1- 3	2	0	0.0
O	IPS COMPUTER MARKET.	1- 4	1	0	0.0
O	KEANE ASSOCIATES	4- 8	4 1/4	- 1/4	-5.5
A	LOGICON	23- 38	28 5/8	-1 1/2	-4.8
O	MNGT SCI AMER INC	17- 26	21 3/4	- 1/2	-2.2
O	MATHEMATICA INC	12- 24	22 1/2	+ 1/2	+2.2
O	MATHEMATICAL APP GRP	15- 28	17	-1 1/2	-8.1
O	NATIONAL DATA CORP	14- 28	18 7/8	0	0.0
O	PLANNING RESEARCH	5- 13	5 7/8	+ 1/4	+4.4
O	PROGRAMMING & SYS	1- 2	1 1/8	0	0.0
O	RAPIDATA INC	5- 17	15 3/4	0	0.0
O	REYNOLDS & REYNOLD	16- 26	18 1/4	- 1/2	-2.5
O	SEI CORP	17- 28	24 1/4	0	0.0
O	STSC INC	7- 28	7 1/2	- 1/4	-3.2
O	SCIENTIFIC COMPUTERS	8- 16	7 3/4	- 1/4	-3.1
O	SOFTWARE AG	11- 23	13	0	0.0
N	TYMSHARE INC	23- 50	27 1/2	-1	-3.5
A	UNI GRP	11- 18	12 3/4	- 1/4	-1.8
N	WYLY CORP	7- 20	8 1/2	+ 1/2	+6.2
	PERIPHERALS & SUBSYSTEMS				
N	AM INTERNATIONAL	4- 25	4 3/8	+ 3/8	+8.3
A	ANDERSON JACOBSON	10- 28	12 1/2	0	0.0
O	AUTO-TROL TECHNOLOGY	9- 82	8 3/4	-1	-10.2
O	RANCTEC INC	20- 35	30 3/4	-1 3/4	-5.3
O	BEEHIVE INT'L	6- 18	8 1/2	+ 1/2	+6.2
A	BOLT,BERANEK & NEW	9- 25	10	+ 1/8	+1.2
O	CAMBEX CORP	2- 8	2 1/2	- 3/8	-13.0
N	CENTRONICS DATA COMP	7- 40	13 1/4	+ 1/4	+1.9
A	CETEC CORP	4- 9	4 5/8	+ 1/4	+6.0
O	COMPUTER DEVICES INC	4- 10	7	- 3/4	-9.6
O	COGNITRONICS	3- 11	2 7/8	0	0.0
O	COMPUTER COMMUN.	1- 8	7/8	0	0.0
A	COMPUTER CONSOLES	19- 28	22 1/4	- 1/4	-1.1
O	COMPUTER TRANSCEIVER	3- 9	5 1/2	+ 1/4	+4.7
N	COMPUTERVISION CORP	20- 49	31 5/8	-1	-3.0
N	CONRAC CORP	17- 28	24 1/4	-3 1/8	-11.4
A	DATA ACCESS SYSTEMS	5- 23	5	- 3/4	-13.0
A	DATAPRODUCTS CORP	19- 44	20 3/8	- 1/8	-0.6
O	DATUM INC	2- 5	1 5/8	- 1/8	-7.1
O	DAVID JAMISON CARLYL	3- 6	5 3/4	- 1/4	-4.1
O	DECISION DATA COMPUT	3- 6	2 7/8	- 1/8	-4.1
O	DELTA DATA SYSTEMS	2- 4	1 7/8	- 3/8	-16.6
O	DATARAM CORP	4- 15	6 7/8	- 3/8	-5.1
N	ELECTRONIC M & M	3- 9	3 1/8	0	0.0
O	EVANS & SUTHERLAND	18- 40	26 1/2	-2 3/4	-9.4
O	FABRI-TEK	2- 6	4 3/8	+ 1/2	+12.8
O	GENERAL COMPUTER SYS	1- 12	7	0	0.0
N	GEN'L DATA COMM IND	8- 19	8 1/8	0	0.0
O	GENERAL TERMINAL CP	1- 4	1 7/8	0	0.0
N	HAZELTINE CORP	19- 35	26 3/8	- 1/8	-0.4
O	INFORMATION INTL INC	8- 17	11	+1	+10.0
O	INTEL CORP	22- 51	22	-1	-4.3
O	IPL SYSTEMS INC	8- 15	6 3/4	-1 1/4	-15.8
A	LUNDY ELECTRONICS	7- 18	8 1/4	- 1/4	-2.8
A	MSI DATA CORP	11- 27	16 1/4	+ 1/4	+1.5
O	NETWORK SYSTEMS CORP	14- 25	20	-1 1/2	-8.9
O	OMEX	2- 12	8	0	0.0
N	PARADYNE CORP	25- 52	39 1/8	-1 5/8	-3.9
A	PENRIL CORP	8- 17	8 1/2	+ 3/8	+4.6
O	RAMTEK CORP	9- 23	13 3/8	0	0.0
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O	SCAN DATA	1- 5	3/4	0	0.0
N	STORAGE TECHNOLOGY	18- 40	34 3/8	-1 1/2	-4.1
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A	T BAR INC	12- 19	13 1/2	- 1/2	-3.5
A	TEC INC	4- 7	5 7/8	+ 1/2	+9.3
N	TEKTRONIX INC	48- 70	55	+ 1/4	+0.4
N	TELEX	5- 9	6 1/8	- 1/4	-3.8
O	TESDATA SYSTEMS CP	6- 17	7 1/4	- 1/4	-3.3
A	TIMEPLEX INC	8- 19	9 1/4	- 3/4	-7.5
O	WILTEK INC	1- 3	1 3/4	- 1/2	-22.2
	SUPPLIES & ACCESSORIES				
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O	BALTIMORE BUS FORMS	1- 2	1/2	0	0.0
N	BARRY WRIGHT	15- 24	17 1/2	- 3/4	-4.1
O	CYBERNETICS INC	1- 2	1 1/8	+ 1/16	+5.8
A	DUPLEX PRODUCTS INC	12- 17	13 1/2	+ 3/8	+2.8
N	ENNIS BUS. FORMS	15- 23	20 1/4	- 1/4	-1.2
N	IM COMPANY	48- 65	53 7/8	- 1/8	-0.2
O	MOORE CORP LTD	27- 38	32 1/2	- 7/8	-2.6
N	NASHUA CORP	17- 33	17 3/4	0	0.0
O	STANDARD REGISTER	30- 41	34 3/4	+ 1/4	+0.7
A	TAB PRODUCTS CO	15- 36	17 3/8	- 5/8	-3.4
N	WALLACE BUS FORMS	22- 36	33 1/8	+ 3/8	+1.1

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH; B=BOSTON; L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER

O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID

(1) TO NEAREST DOLLAR

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City_____ State_____ Zip_____

Telephone_____ CW